OKI MICROLINE ML3410

MAINTENANCE MANUAL

PREFACE

This maintenance manual describes how to maintain the Microline 3410 printer in the field.

This manual is for customer engineers.

For further information, refer to the User's Manual for handling or operating the equipment.

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1. CONFIGURATION

1. CONFIGURATION

1.1 Standard Printer Configuration

ML3410 consists of the following assemblies:

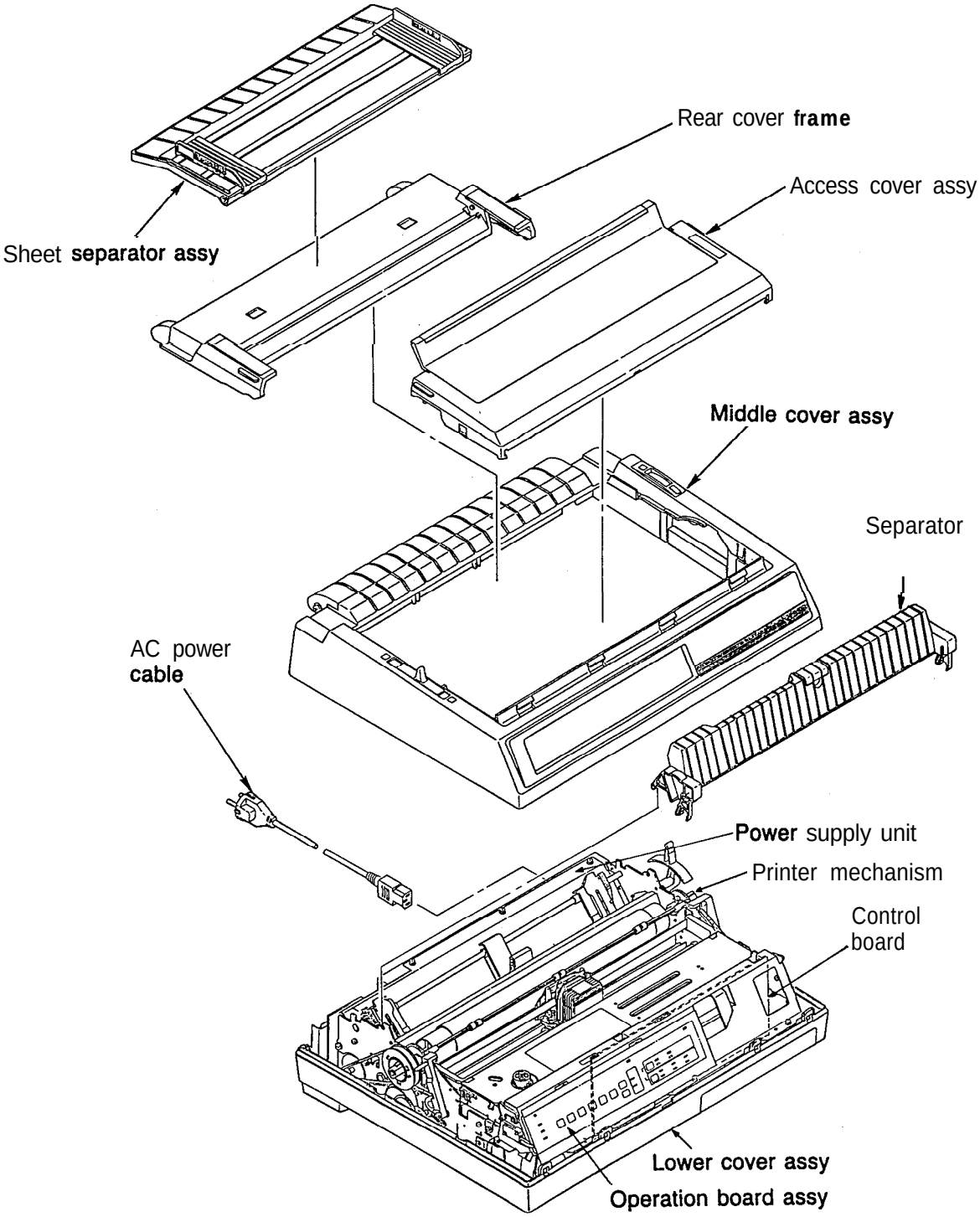
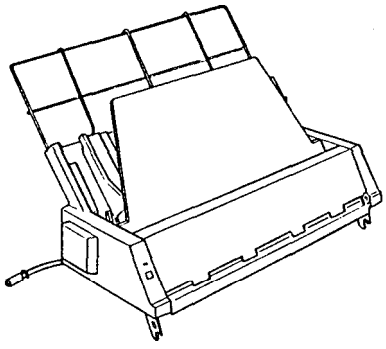


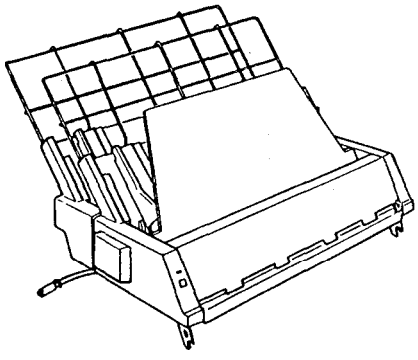
Figure I-I Configuration

1.2 Options

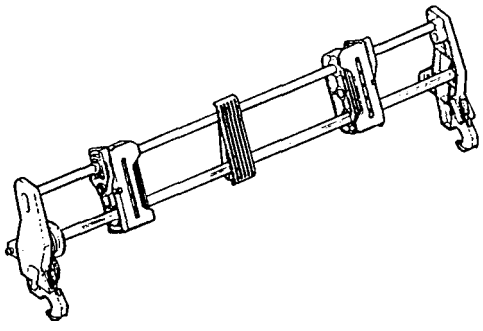
(1) **Single bin cut sheet feeder unit (CSF)**



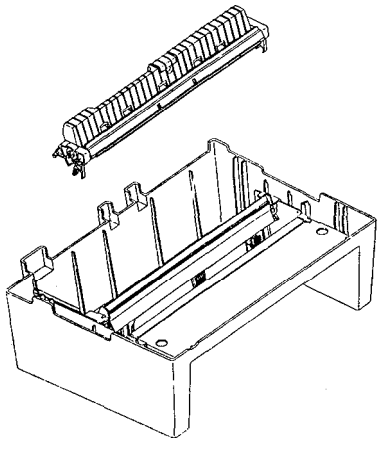
(2) **Dual bin cut sheet feeder unit (D Bin CSF)**



(3) **Pull-tractor unit**



(4) **Bottom push tractor unit with Pull-up roller**



2. INSTALLATION PROCEDURE

2 Installation procedure

2.1 Unpackaging

21.1 Unpacking the packing box

(1) **Open the packing box.**

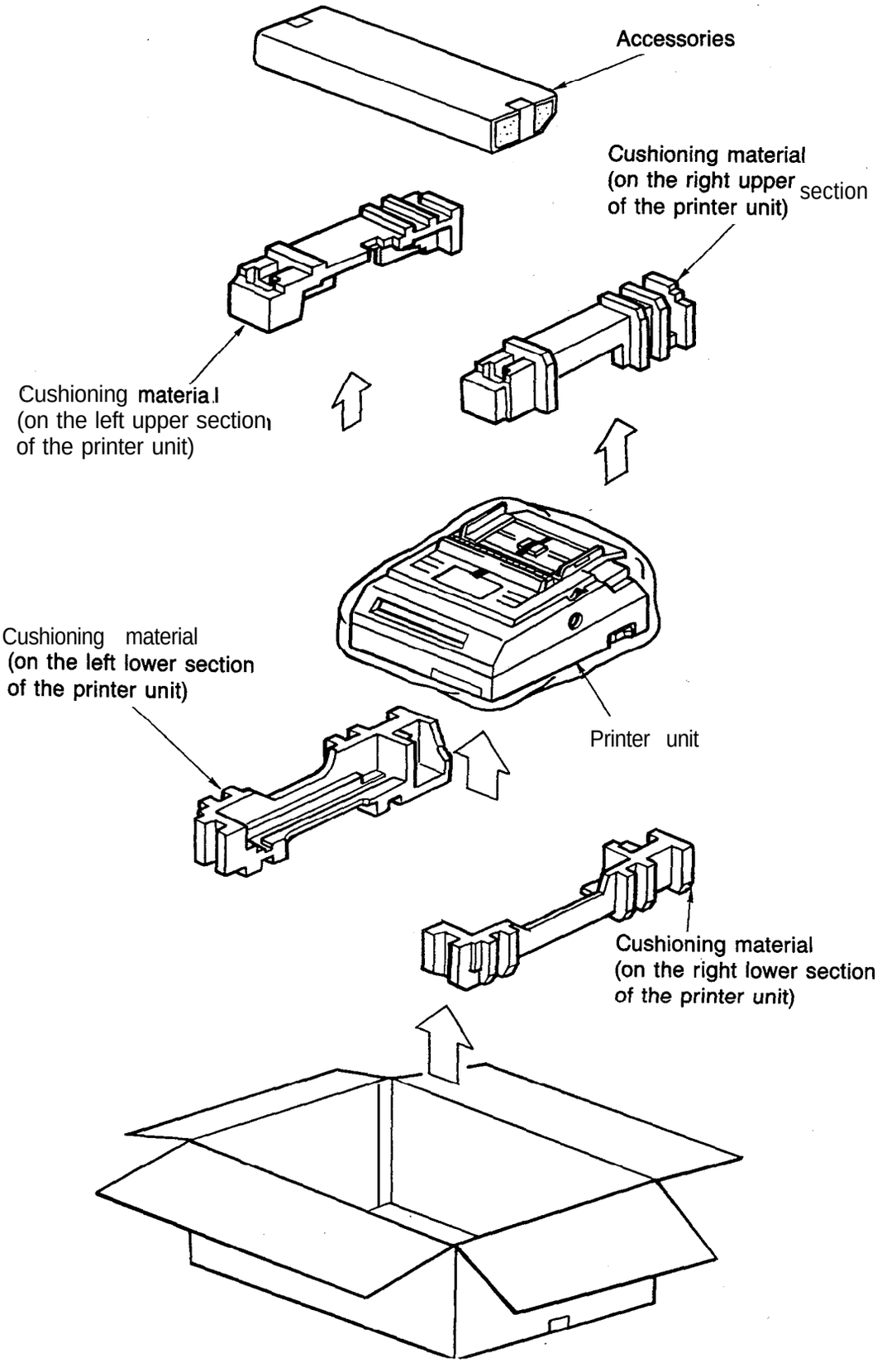
(2) **Remove the two cushioning materials from the left upper and right upper sections of the printer unit.**

(3) **Remove the platen knob from the cushioning materials.**

(4) **Remove the printer unit.**

(5) **Remove the ribbon cartridge and the cushioning materials from its right lower and left lower sections.**

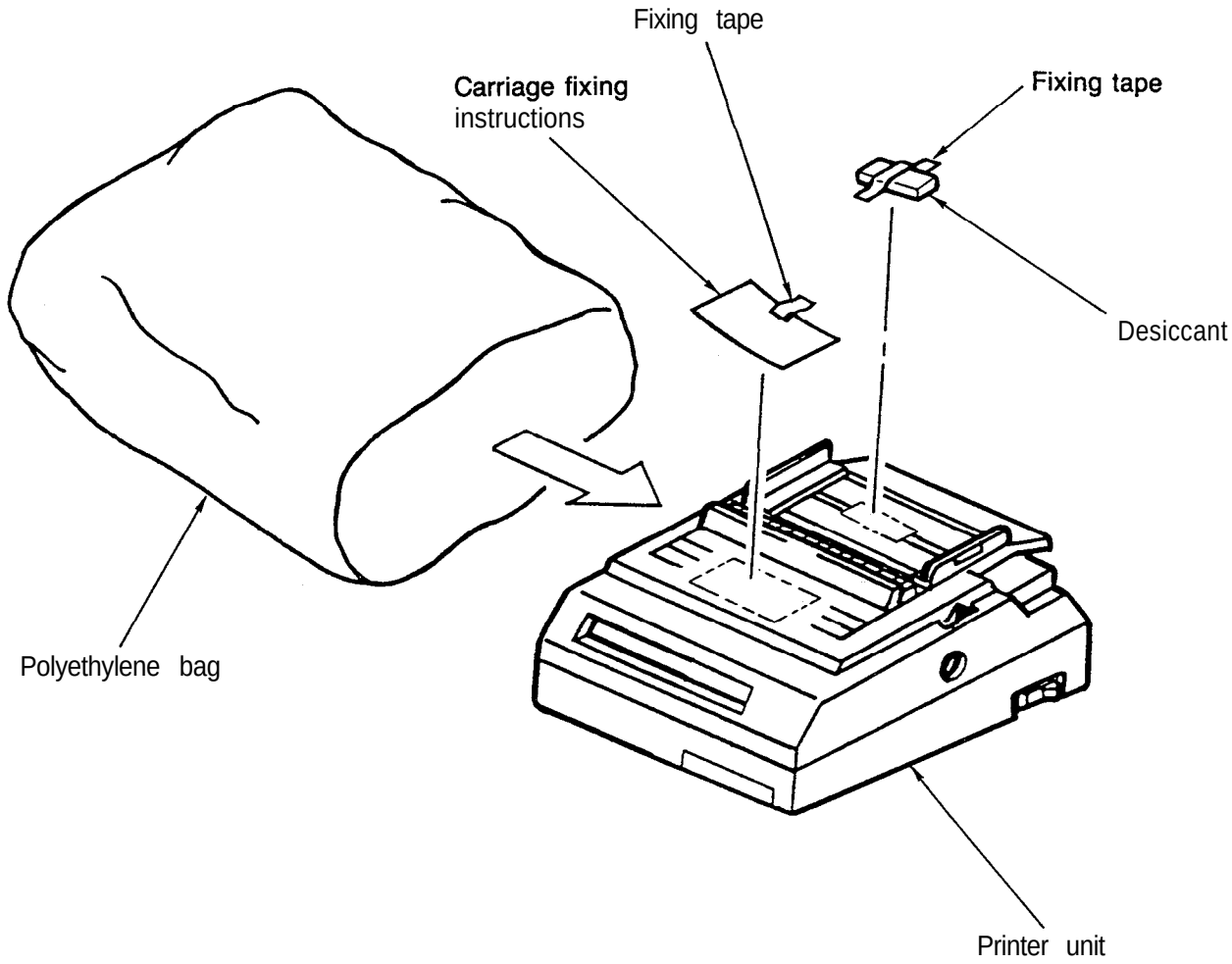
(6) **Peel the fixing tape off the bottom of the packing box and remove the accessories.**


Accessories
Cushioning material
(on the right upper section
of the printer unit)
Cushioning material
(on the left upper section
of the printer unit)
Cushioning material
(on the left lower section
of the printer unit)
Printer unit
Cushioning material
(on the right lower section
of the printer unit)

2.1.2 Unpacking the printer unit

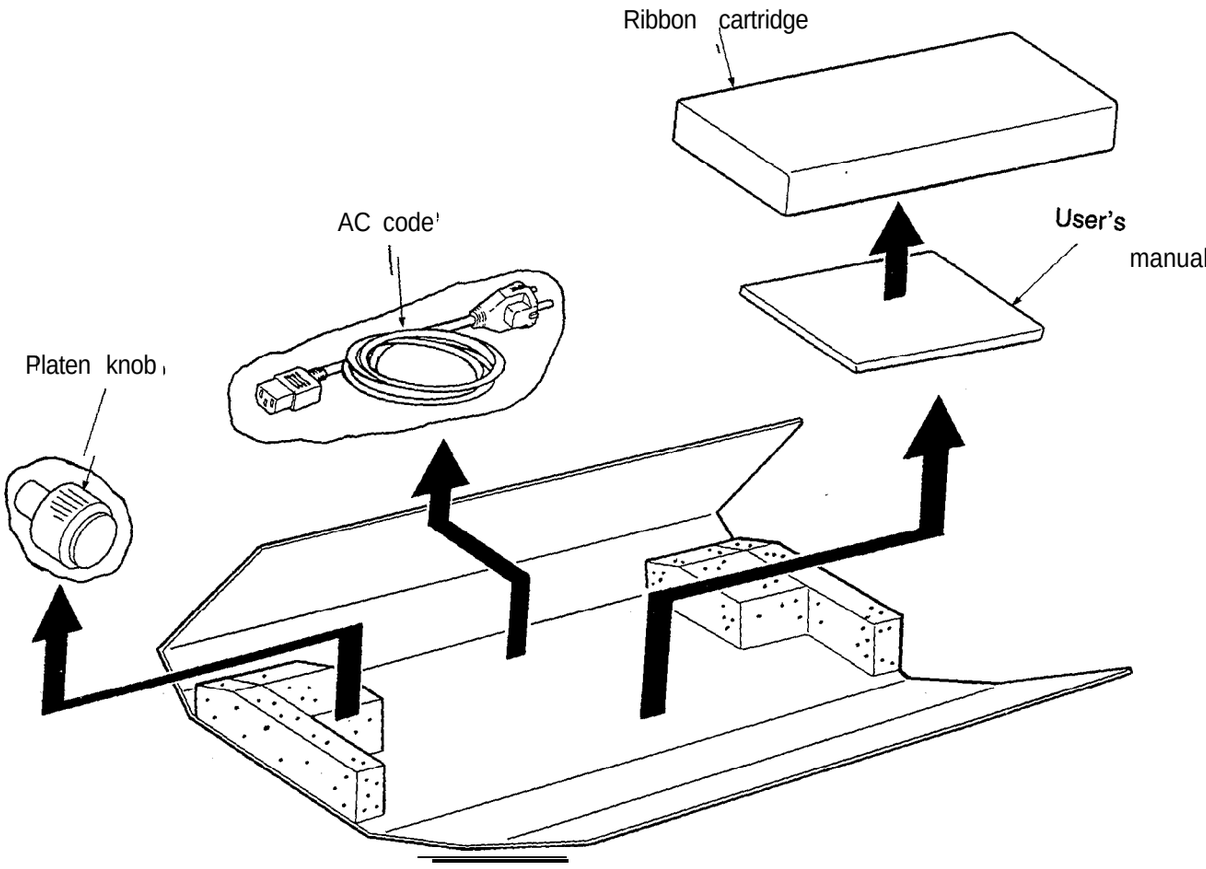
(I) Remove the printer unit from the polyethylene bag.

(2) Peel the fixing tape **off the desiccant and the carriage fixing instructions to** remove them from the printer unit.



2.1.3 Unpacking the accessories

(1) Remove the AC cable, and user's manual from the polyethylene bag.



2.2 Installation (For details, refer to the Setup Guide.)

2.2.1 Precautions for installation

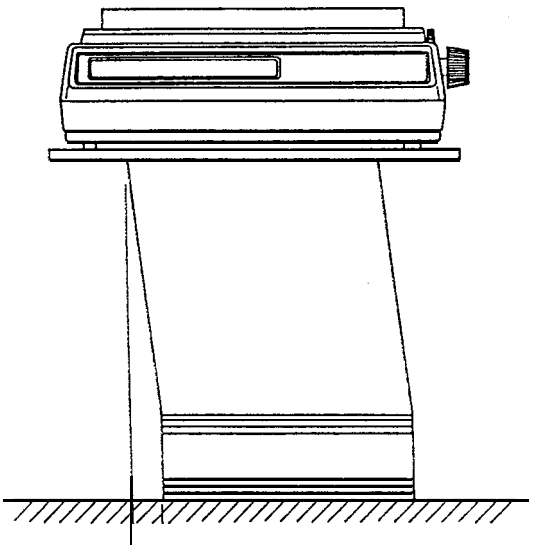
When installing the printer, observe the following precautions:

(I) Do not install the printer in the following places:
- a) **Place exposed to direct sunlight**
- b) **Place with great fluctuations in temperature**
- c) **Place exposed to outdoor wind**
- d) **Dusty place**
- e) **Near a door**
- f) **Too near an air conditioner.**
- g) **Place subject to heavy vibrations**

(2) **Adjust the temperature and humidity of the installation site as follows:**
Temperature: 50°F **to** 104°F (5°C **to** 40°C)
Humidity: 20%RH **to** 80%RH

(3) **To install the printer and printing paper, observe the following procedure:**
a) Adjust the height of the desk on which to place the printer to 30 inches (75 cm) as a standard. (See to it that the desk **surface is horizontal and smooth and that the rubber protectors on the bottom of the desk legs are level.)**

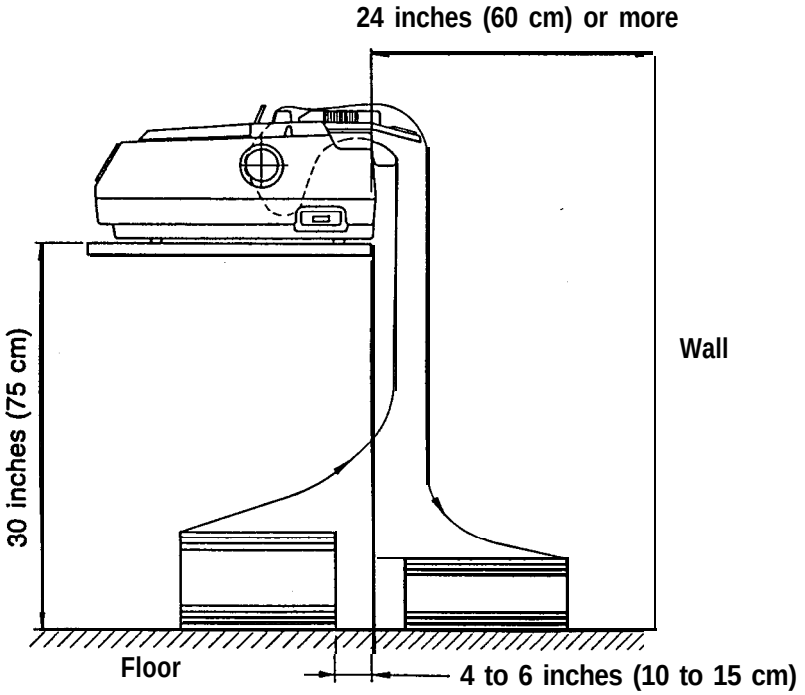
b) **Set the printing paper on the floor below the printer so that it may be fed into the printer without skewing from the feeding path by more than 2 inches (5 cm).**



2 inches (5 cm) or less I **(**

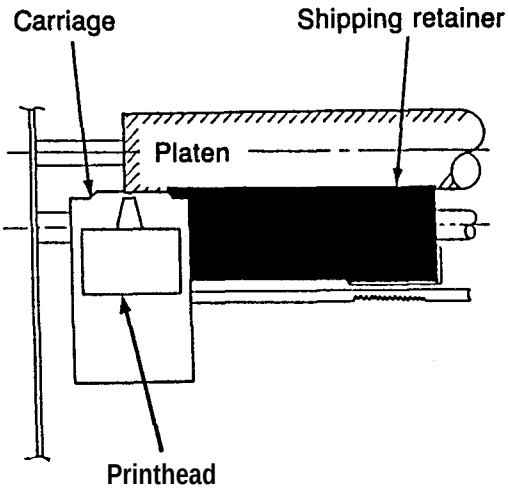
c) Align the rear section of the printer with the rear edge of the desk. Keep a distance of 24 inches (60 cm) or more between the rear section of the printer unit and the wall to provide a space for printed paper being fed out.

d) Keep a distance of 4 to 6 inches (10 to 15 cm) or more between the unprinted paper fed into the printer and the printed paper fed out of the printer. If the paper going in one direction interferes with the paper going the other way, they may jam inside the printer.



2.2.2 Removing the shipping retainer

Remove the shipping retainer that secures the printhead.

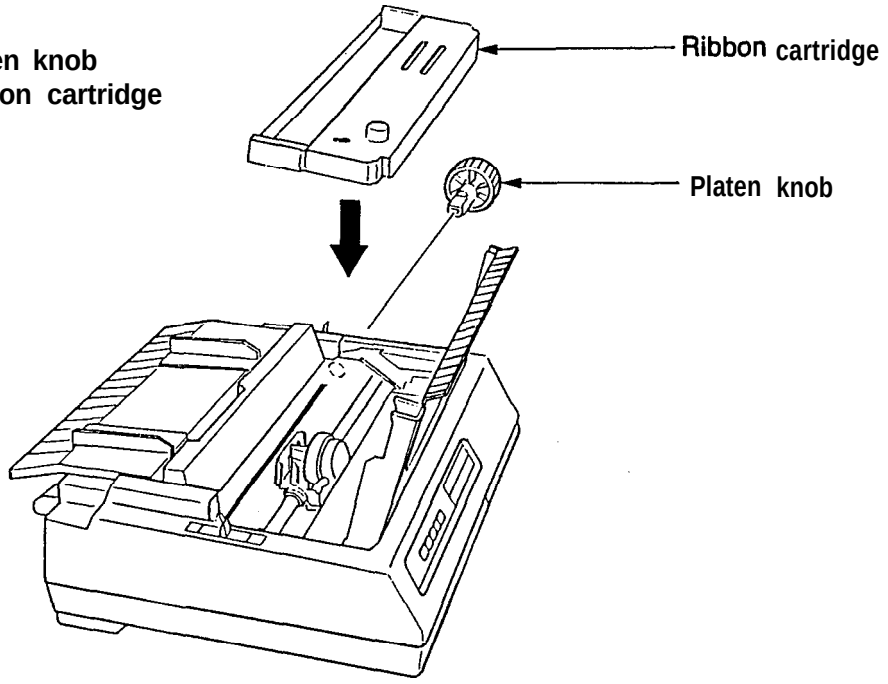


Note: *Be sure to replace the shipping retainer whenever you ship your printer. It secures the printhead in place to protect it.*

2.2.3 Installing the accessories

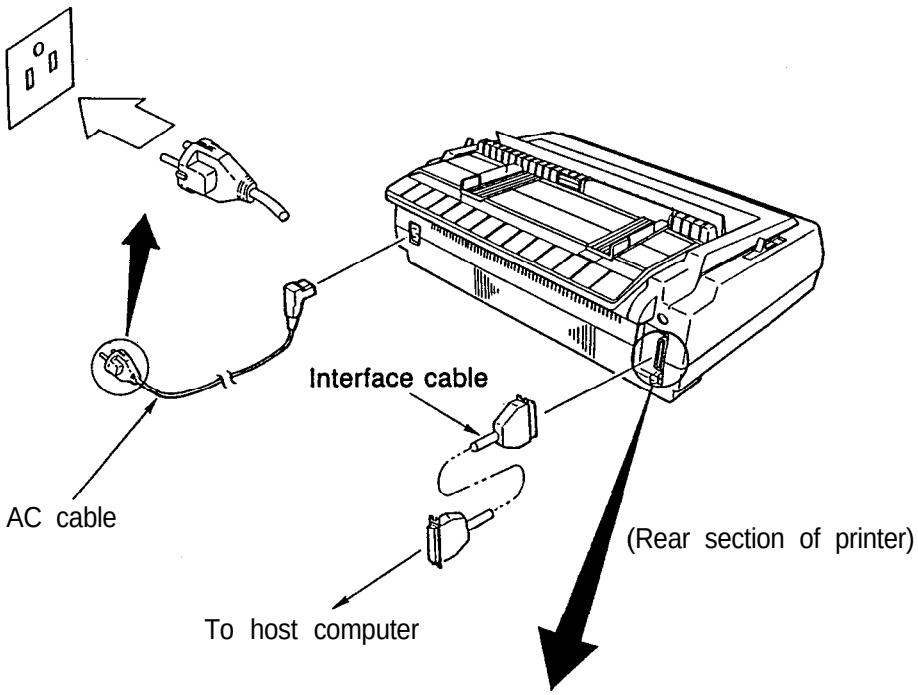
Install the following accessories removed from the unpacked packing box on the printer unit:

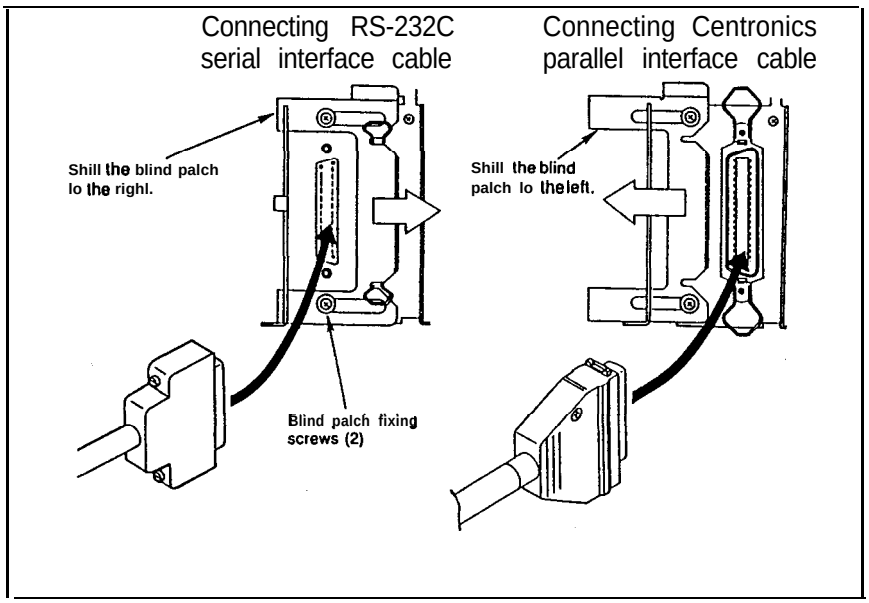
(1) **Platen knob**
(2) **Ribbon cartridge**



2.2.4 Connecting cables

(1) Connect the AC cable to the printer.
(2) Connect the interface cable to the printer.

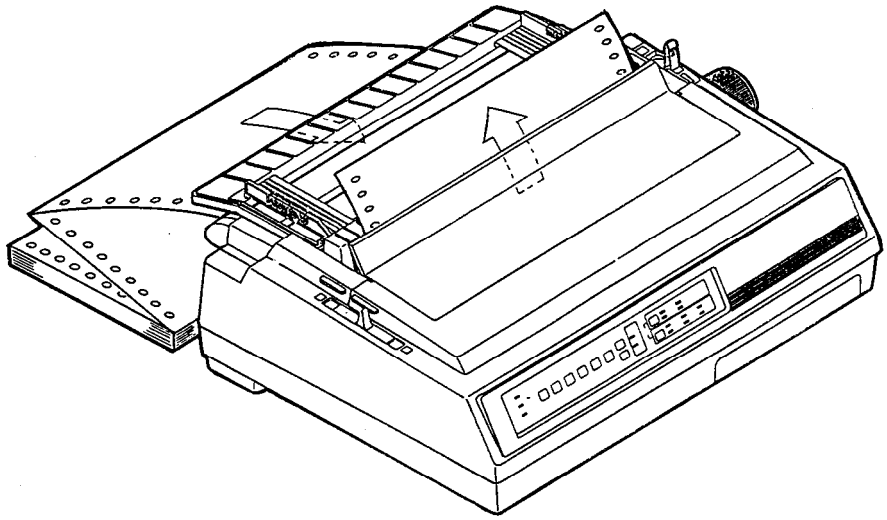



Connecting RS-232C serial interface cable
Connecting Centronics parallel interface cable
Shill the blind palch lo the righl.
Shill the blind palch lo the left.
Blind palch fixing screws (2)

Note: Unit is shipped with the Parallel Port exposed. No bracket adjustment is necessary unless using M-232.

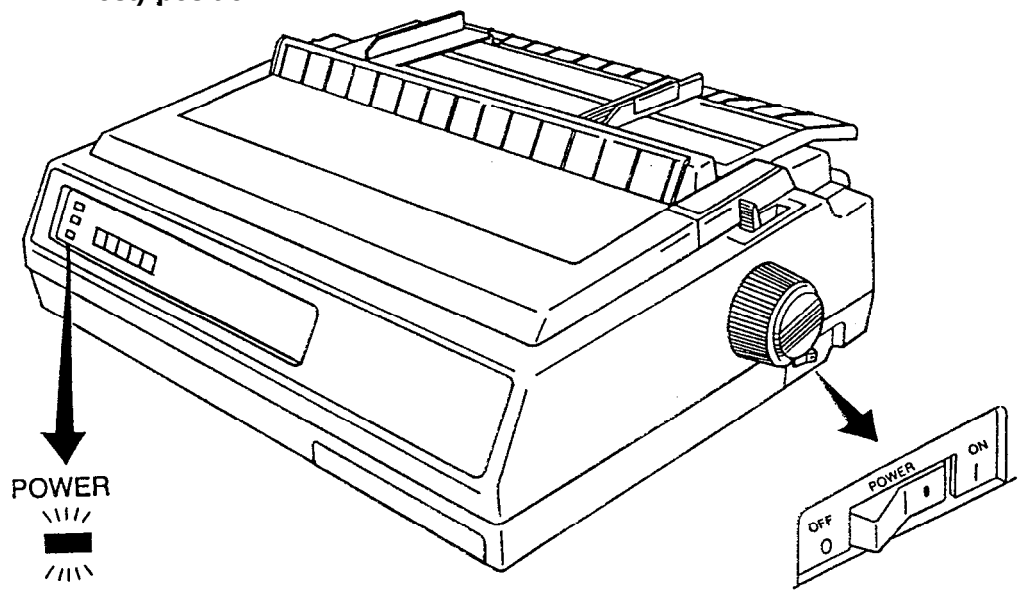
2.2.5 Installing paper

Install printing paper on the printer for the test run.



2.2.6 Powering on

(1) Turn on the POWER switch on the right side of the printer unit.
(2) Confirm that the POWER LED is on and that the printhead returns to its home (left most) position.



(3) If the printer unit shows no abnormality after it is powered on, proceed to the next step (4) for test printing.

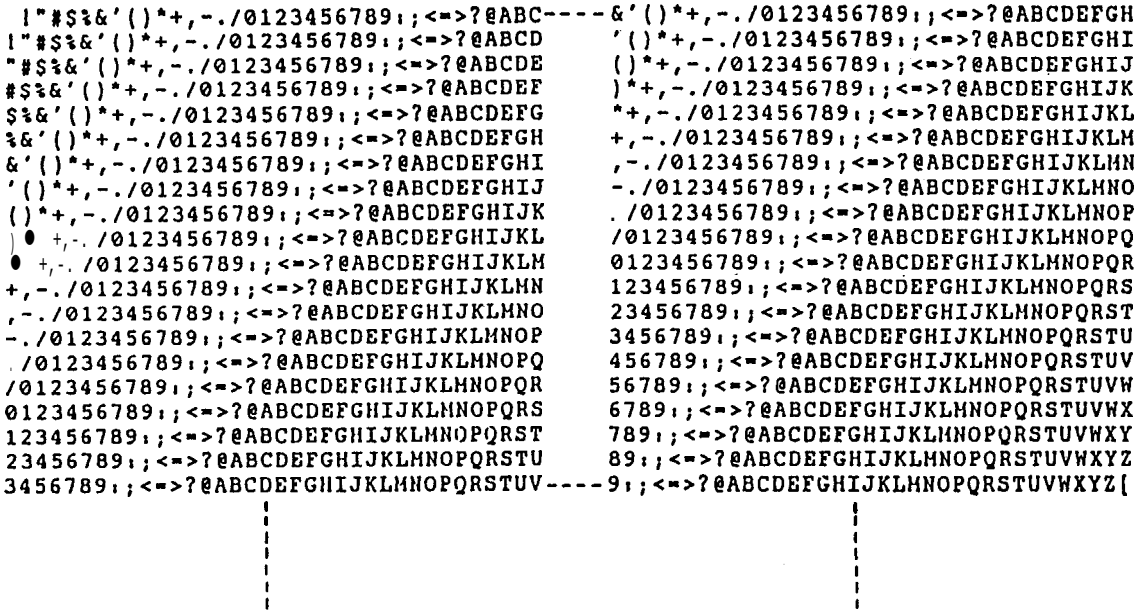
(4) Test printing

a) After confirming that the POWER switch is off,turn it on while pressing the FORM FEED switch.

b) Confirm that the printer unit prints out the test pattern as shown in the figure below.

c) Press the SELECT switch to end the printing test.

d) Confirm that the SELECT lamp is on, indicating that the printer unit is ready to receive printing data from the host computer.



2.3 MENU SELECTION

2.3.1 OVERVIEW:

Access "global" type printer features/functions as directly as possible. Features selected in MENU mode become the default features for the printer each time it is powered on. The Menu function allows the ability to activate features without the use of software commands. Software commands will override MENU settings.

2.3.2 KEY FUNCTIONS:

Key Name	Function
GROUP	General categorization of functions/features. Selects next GROUP title, once through the entire list, loops back to the first GROUP.
ITEM	Direct name of functions/features. Selects next ITEM title, once through the entire list, loops back to the first ITEM in the current GROUP.
SET	Value (setting) of the ITEM. Selects next SETTING value, once through the entire list, loops back to the beginning of the list.
PRINT	Prints entire MENU and returns to top of MENU list.
EXIT	Saves any changed settings and leaves the MENU.

2.3.3 OPERATION

1. **To enter Menu mode depress PQ and CPI switch.**

   a. Printer = deselected state. SEL LED = off

   b. Press GROUP switch to print first MENU item.

2. **Upon entering Menu mode, the first GROUP - ITEM - SET is printed.**

3. **See Key functions above for description of operation.**

4. **To exit MENU mode depress the EXIT switch.**

5. **If conflicting functions are set in menu mode, the printer will treat these function according to the priority table.**

6. **The TOF position is not affected by MENU mode.**

7. **Depressing TOF/SEL switches simultaneously on power up will reset the menu back to its factory settings. (see FACTORY SETTINGS for further details.)**

Note: When entering/exiting Menu *mode, the user is not prompted.*

2.3.4 TABLE OF MENU SELECTIONS

NOTE: Factory settings are bold printed.

Group	Item	Setting
Printer Mode	**Emulation Mode**	**IBM PPR, EPSON FX**
Font	**Print** Mode	**Utility, NLQ Courier, NLQ Gothic, HSD**
	Pitch	**10 CPI**, **12** CPI, **15** CPI, **17.1** CPI, **20** CPI **Proportional**
	Style	**Normal, Italics**
	Size	**Single, Double**
Symbol Sets	**Character Set**	**Set II, Set I**
	Language Set	**American(F), French, German, British, Danish I, Swedish I, Italian, Spanish I, Japanese, Norwegian, Danish II, Spanish II, Latin American, French Canadian, Dutch, Swedish II, Swedish III, Swedish IV, Turkish, Swiss I, Swiss II, Publisher**
	Zero Character	**Unslashed, Slashed**
	Slash Letter 0	**No, Yes**
	Code Page	**USA, Canada-French, Multilingual, Portugal, Norway, Turkey, Greek_437, Greek_851, Greek_928, Cyrillic, Polska Mazovia, Polska PC Latin 2, Serbo Croatic I, Serbo Croatic II, ECMA-94**
Rear Feed	**Line Spacing**	**6 LPI, 8 LPI**
	Form Tear Off	**Off, 500 ms, 1** sec, **2** sec
	Skip Over Perforation	**No, Yes**
	Page Width	**13.6", 8"**
	Page Length	**II", 11** 2/3", **12"**, 14", 17", 3", 3.5", 4", 5.5", 6", 7", 8", **8.5"**
Bottom Feed	**Line Spacing**	**6 LPI, 8 LPI**
	Form Tear Off	**Off, 500 ms,** 1sec, **2** sec
	Skip Over Perforation	**No, Yes**
	Page Width	**13.6", 8"**
	Page Length	**II", 11** 2/3", **12"**, 14", 17", 3", 3.5", 4", 5.5", 6", 7", 8", **8.5"**
Top Feed	**Line Spacing**	**6 LPI, 8 LPI**
	Skip Over Perforation	**No, Yes**
	Page Width	13.6", **8"**
	Page Length	**11"**, **11 2/3"**, 12", 14", 17", 3", 3.5", 4", 5.5", 6", 7", 8", **8.5"**

Group	Item	Set (Value) Selection
Set-Up	Graphics	Bi-directional, Uni-directional
	Receive Buffer Size	16K, 28K, 1 Line, 4K
	Paper Out Override	No, Yes
	Print Registration	0.00 mm, 0.05 mm Left, 0.10 mm Left, 0.15 mm Left, 0.20 mm Left, 0.25 mm Left, 0.25 mm Right, 0.20 mm Right, 0.15 mm Right, 0.10 mm Right, 0.05 mm Right
	Operator Panel Function	Full Operation, Limited Operation
	Reset Inhibit	No, Yes
	Print Suppress Effective	Yes, No
	Auto LF	No, Yes
	Auto CR (IBM PPR Only)	No, Yes
	CSF Bin Select	Bin 1, Bin 2
	SI Select Pitch (IO CPI) (IBM PPR Only)	17.1 CPI, 15 CPI
	SI Select Pitch (12 CPI)(IBM PPR Only)	20 CPI, 12 CPI
	Time Out Print	Valid, Invalid
	Auto Select	No, Yes
	Sensor Disable	No, Yes
Parallel I/F(*1)	I-Prime	Buffer Print, Buffer Clear, Invalid
	Pin 18	+5V, Open
	Auto Feed XT (EPSON FX Only)	Invalid, Valid
Serial I/F (*2)	Parity	None, Odd, Even
	Serial Data 7 or 8 Bits	8 Bits, 7 Bits
	Protocol	Ready/Busy(F), X-ON/X-OFF
	Diagnostic Test	No, Yes
	Busy Line	SSD-, SSD+, DTR, RTS
	Baud Rate	9600 BPS, 4800 BPS, 2400 BPS, 1200 BPS, 600 BPS, 300 BPS, 19200 BPS
	DSR Signal	Valid, invalid
	DTR Signal	Ready on Power Up, Ready on Select
	Busy Time	200 ms, 1 sec

(*1) or (*2) appeares one of two according to the Interface Selection.

2.3.5 EXAMPLE: Set Default Font to Courier. (Not printed in full size)

Step	Printout		
(1) Push PQ and CPI sw.	Menu Mode		
(2) Push GROUP sw twice.	Printer Mode	Emulation Mode	IBM PPR
	Font	Print Mode	Utility
(3) Push SET sw to set value.	Font	Print Mode	NLQ Courier
(4) Push PRINT sw to print current Menu.	Printer Mode	Emulation Mode	IBM PPR
	Font	Print Mode	NLQ Courier
	Font	Pitch	10 CPI
	Font	Style	Normal
	Font	Size	Single
	Symbol Sets	Character Set	Set I
	Symbol Sets	Language Set	American
	Symbol Sets	Zero Character	Slashed
	Symbol Sets	Slash Letter 0	No
	Symbol Sets	Code Page	USA
	Rear Feed	Line Spacing	6 LPI
	Rear Feed	Form Tear-Off	Off
	Rear Feed	Skip Over Perforation	No
	Rear Feed	Page Width	13.6"
	Rear Feed	Page Length	11″
	Bottom Feed	Line Spacing	6 LPI
	Bottom Feed	Form Tear-Off	Off
	Bottom Feed	Skip Over Perforation	No
	Bottom Feed	Page Width	13.6"
	Bottom Feed	Page Length	11″
	Top Feed	Line Spacing	6 LPI
	Top Feed	Skip Over Perforation	No
	Top Feed	Page Width	8″
	Top Feed	Page Length	11″
	Set-Up	Graphics	Bi-directional
	Set-Up	Receive Buffer Size	16K
	Set-Up	Paper Out Override	No
	Set-Up	Print Registration	0.00 mm
	Set-Up	Operator Panel Function	Full Operation
	Set-Up	Reset Inhibit	No
	Set-Up	Print Suppress Effective	Yes
	Set-Up	Auto LF	No
	Set-Up	Auto CR	No
	Set-Up	CSF Bin Select	Bin 1
	Set-Up	SI Select Pitch (10 CPI)	17.1 CPI
	Set-Up	SI Select Pitch (12 CPI)	20 CPI
	Set-Up	Time Out Print	Valid
	Set-Up	Auto Select	No
	Set-Up	Sensor Disable	No

Step	Printout		
	Serial I/F	Parity	None
	Serial I/F	Serial Data 7 or 8 Bits	8 Bits
	Serial I/F	Protocol	Ready/Busy
	Serial I/F	Diagnostic Test	No
	Serial I/F	Busy Line	SSD–
	Serial I/F	Baud Rate	9600 BPS
	Serial I/F	DSR Signal	Valid
	Serial I/F	DTR Signal	Ready on Power Up
	Serial I/F	Busy Time	200 mS
(5) Push EXIT to exit MENU and return to Print mode.	Menu End		

3. THEORY OF OPERATION

3. THEORY OF OPERATION

3.1 Electrical Operation

(1) Main control board

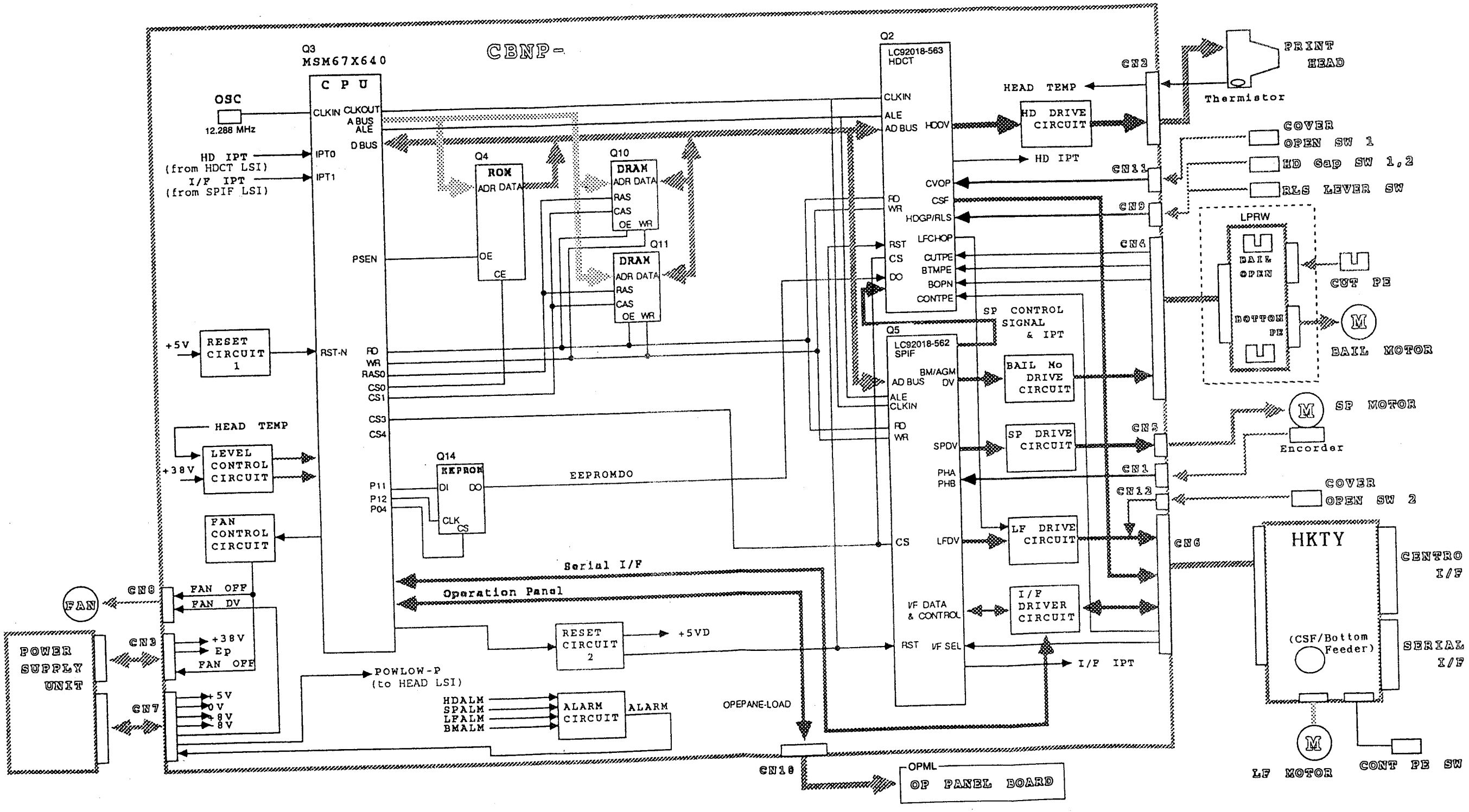
Microprocessor (MPU) controls the whole printer via the peripheral LSIs, memory and other circuits.

Interface circuits and various motor driver circuits are also mounted on this board.

(2) Power supply unit

The power supply unit converts the AC input to +5 VDC, +38 VDC and ±8 VDC.

PM3410 BLOCK DIAGRAM



3.1.1 Main Control Board

(1) Micro processor (Q3: 67X640)

Microprocessor (MPU) is the core of the control circuit. Peripheral circuits operate according to the instructions from the MPU.

(2) Program ROM (Q4: 27C2048 or 27C202)

The control program is stored in this memory. The master MPU executes various controls by using this program.

The following character fonts are stored as the standard fonts also in the ROM.

(a) HIGH-SPEED DRAFT
(b) UTILITY
(c) NLQ
(e) PROPORTIONAL } Courier, Gothic

(3) Dynamic RAMs (Q10 and Q11)

These dynamic RAMs Q10 and Q11, each consisting of 64 K bits × 4 bits, are used as a pair as the receiving data buffer and print buffer, for a total of 64 K × 8 bits.

(4) EEPROM (Q14)

This 256-bits serial electrically erasable and programmable ROM stores the menu data.

(5) LSI (Q5: LC92018-562)

This LSI for motor control and interface control has the following functions:

(a) Space motor speed control

This LSI accelerates and decelerates the space motor according to the input commands from the MPU. It also controls the space motor speed in each printing mode.

(b) Space motor position information generation

This LSI generates the normalized motor position signal to generate dot on timing according to the output (phase A or B) of the encoder built in the space motor and sends the information to another LSI (Q2).

(c) Interface control

This LSI is used as the control, input and output ports for the parallel and serial interface data and various interface signals.

The input signal to pin 32 (IFSEL) of the LSI enables selection between the parallel and serial interface modes.

(d) I/O port

This LSI has a 21-bit output port and a 5-bit input port. It outputs various control signals according to the input commands from the MPU.

It also reads operation panel switch information from the input port.

(e) Address latch

This LSI latches the lower 8 bits (A_0 — A_7) of the address on the MPU, and uses them as the address for read/write from and to peripheral devices.

(6) LSI (Q2: LC92018-563)

This LSI controls the 9-pin stagger printhead under the control of the MPU, and has the following functions:

(a) Dot On timing generation

This LSI generates the Dot On timing (HDIPT) in synchronism with the printing mode and space motor position information from another LSI (Q5).

(b) Drive correction

This LSI determines the magnet drive time with the following corrections when outputting the above signals.

- Correction for edge pin driving
- Correction for the number of pins driven at the same time
- Correction for head gap
- Correction for the driving time difference between odd and even pins

(c) Stepping motor holding control

This LSI outputs the stepping motor drive signal to generate holding to torque. The signal is alternative and continuous with specified duty cycle.

3.1.2 Other Circuits

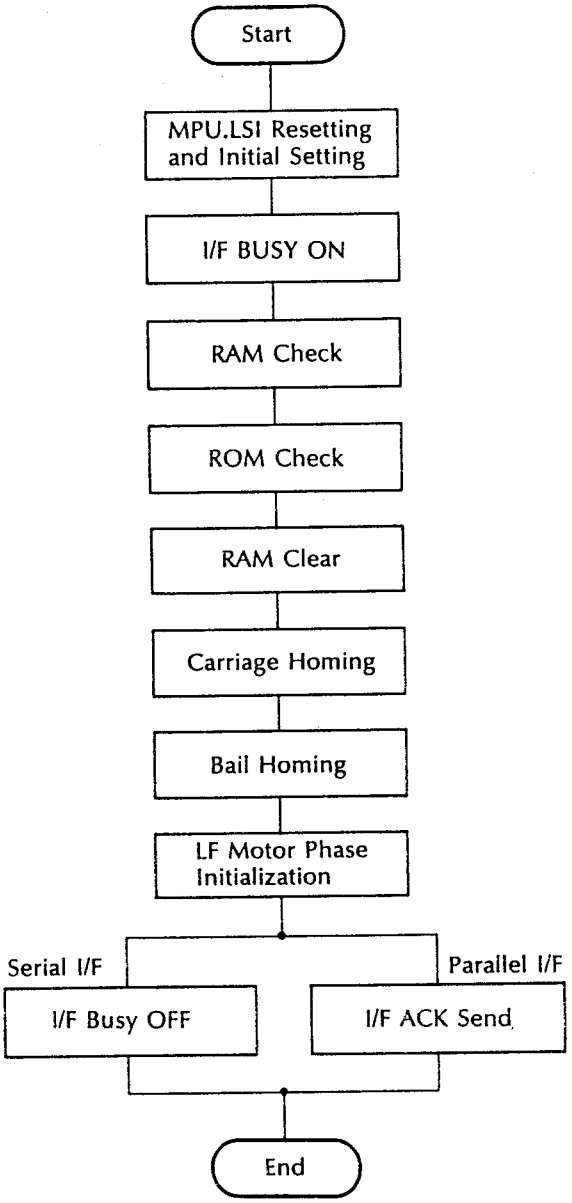
3.1.2.1 Initialize

This printer is initialized when the power is turned on or when the I-PRIME signal is input from the host side via the parallel interface.

For the initialize operation, the RESET-N signal is first output from the reset circuit to reset the MPUs and LSIs. When resetting ends, the program starts and LSIs are reset by MPU via CPU RESET-P. Reset operation by I-PRIME starts program to initialize, but not reset MPU.

The program here sets the mode of the LSIs (Q2, Q5) including the MPU (Q3), checks the memories (ROMs and RAMs), then carries out carriage homing, bail arm homing, and determines the LF motor phase.

Finally, the program establishes the interface signals (P-I/F: ACK signal sending, and S-I/F: BUSY signal off) and lights the SELECT lamp to inform the ready state for receiving to the host side to end the initialize operation.



3.1.2.2 Interface control

The ML3410 is provided with the centronics parallel interface and RS-232C serial interface as standard features. The interface cable can be connected by selecting one of these interfaces. Changing the position of the connector cover of the interface connector assembly turns on or off the microswitch to inform the interface LSI of the interface to be selected. This signal sets the interface LSI to either the parallel or the serial mode.

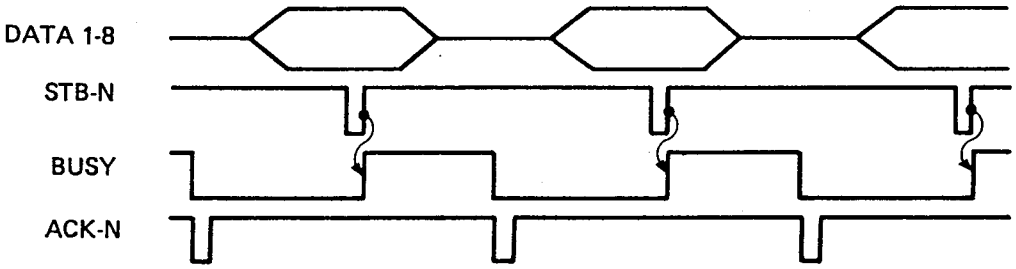
(1) Centronics parallel interface

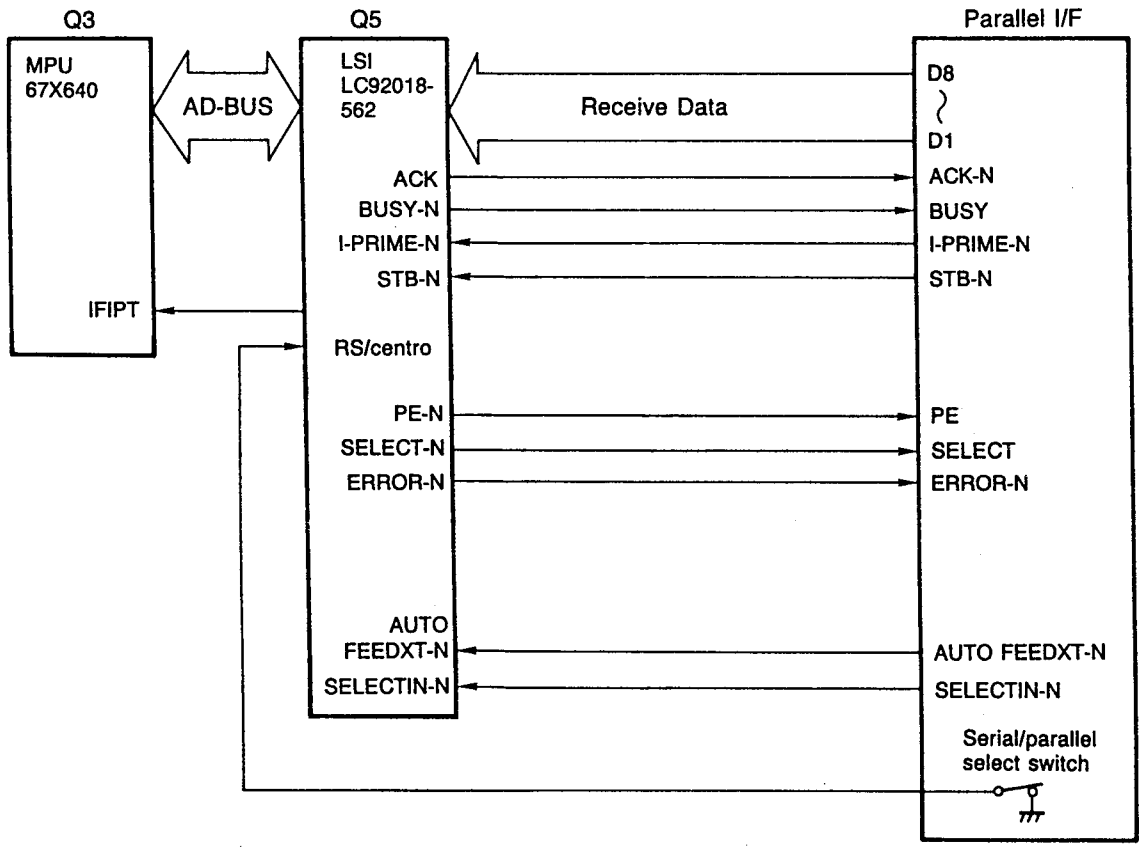
When the microswitch of the interface connector assembly is turned off, the CENTROSEL-N signal goes to the low level to set the LSI (Q5: LC92018-562) to the parallel interface mode.

The parallel data input from the host to the interface LSI is latched to the internal register in the LSI at the rising edge of the STB-N signal.

At the same time, the LSI sets the BUSY-N signal to the low level to inform the host that the data is being processed, and outputs the IFIPT-N signal to inform the MPU of data reception. The data is read upon receiving the RD-N signal from the MPU.

When the data processing ends, the BUSY-N signal is set to off and the ACK-N signal is sent to request the next data. When reception is impossible because the buffer is full, the BUSY signal is sent to request stopping of data transmission.



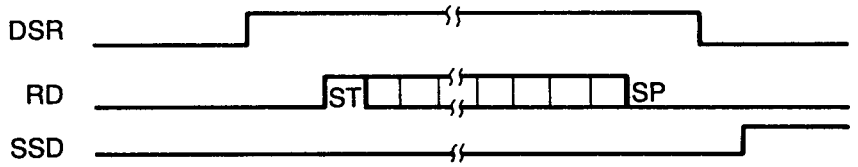


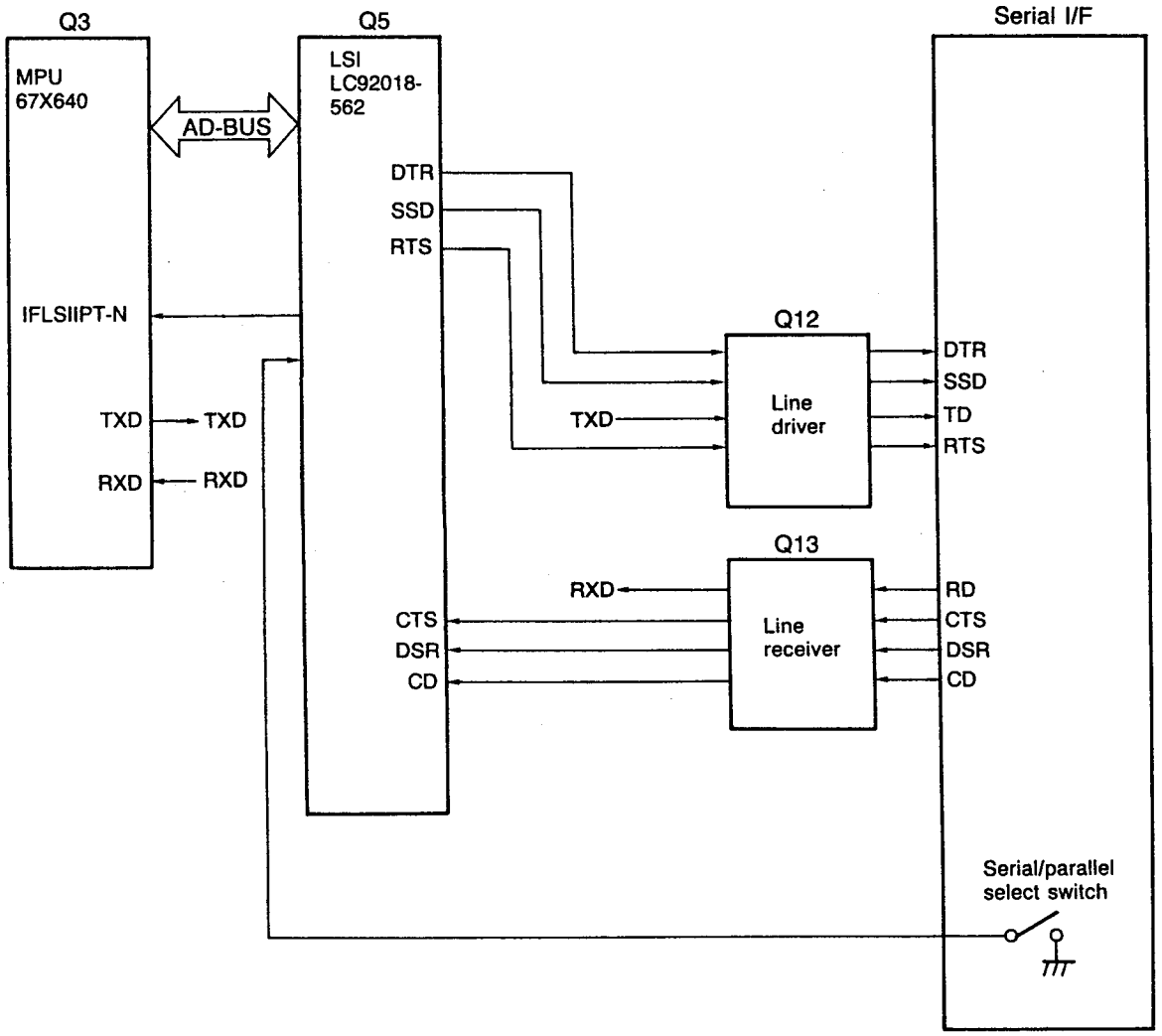
(2) RS-232C serial interface

When the microswitch of the interface connector assembly is turned ON, the CENTROSEL-N signal goes to the high level to set the LSI (Q5) to the serial interface mode.

RS-232C interface signals (DSR, CTS, CD and RD) are converted to the TTL level by the line receiver IC (Q13) and input to the MPU and LSI(Q5). The serial data input to the serial port (pin 57) of the MPU is converted to parallel data by the MPU.

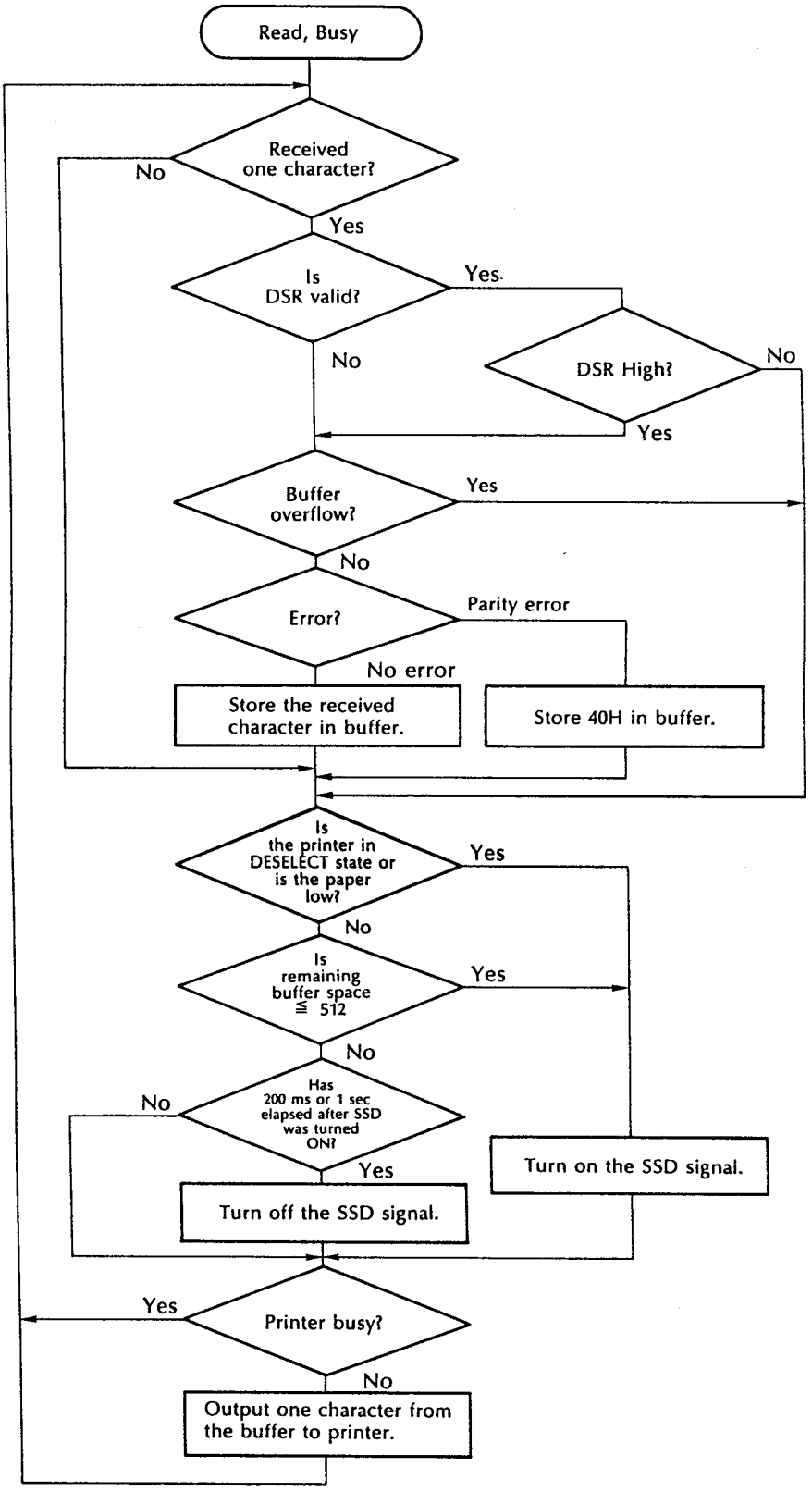
On the other hand, interface signals (DTR, RTS, SSD and TD) output from the MPU and LSI are converted to the RS-232C line voltage by the line driver (Q12) and sent to the serial interface.



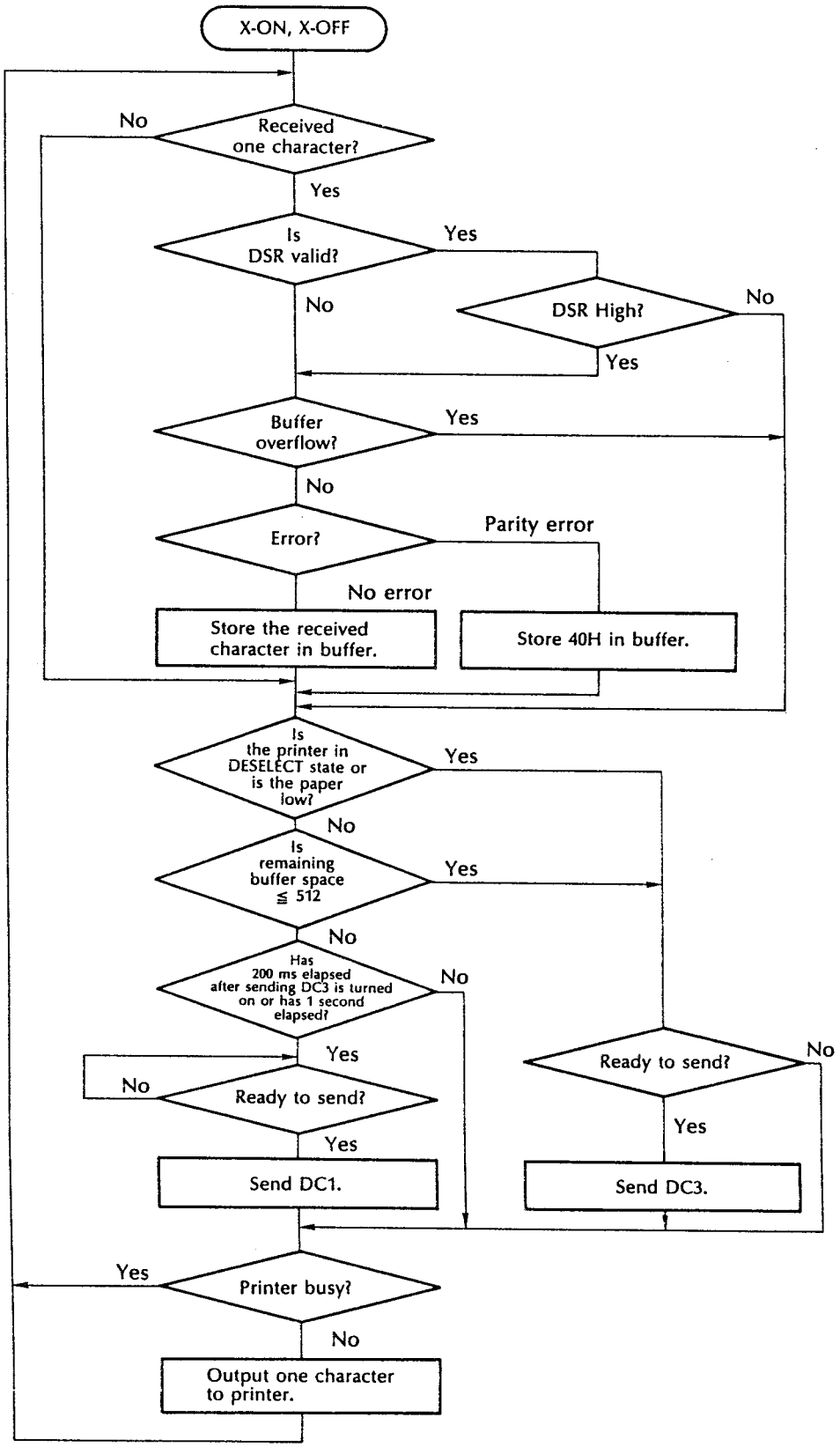


3.1.2.3 Communication procedure flow charts

(1) Ready/busy protocol



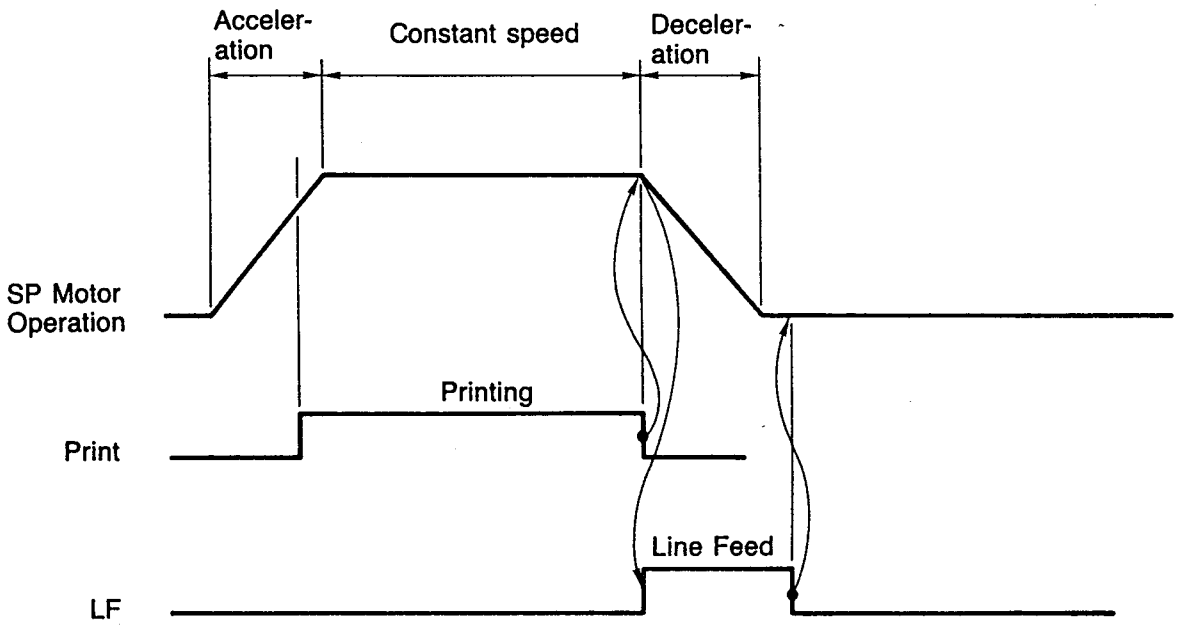
(2) X-ON/X-OFF protocol



3.1.2.4 Printing operation

The time chart for the spacing, printing and line feed operations are as shown below.

The spacing, printing and line feed operations are controlled by the MPU. The MPU also controls the entire timing of these operations.



When starting the printing operation, the MPU specifies the distance moved, print start position, printing speed, etc. to the LSI, and activates the spacing motor. The MPU, when the carriage arrives at the print position specified, activates the printer to start printing, and when printing terminates, the MPU activates the line feed motor for line feed operation. During the line feed operation, the MPU causes the carriage to decelerate. Upon termination of line feed operation, the spacing operation is performed.

3.1.2.5 Printhead control

The printhead is controlled by the head control LSI (Q2: LC92018-563).

Printing is synchronized with the HDIPT-N signal from the MPU.

The head control LSI (Q2) outputs the dot signals (D1 — D9) and overdrive signals (EDCM and ODCM), and the driver IC drives each dot magnet. These signals are output from the head control LSI after the following corrections for final driving time determination inside the LSI:

① **Correction for the number of pins driven**

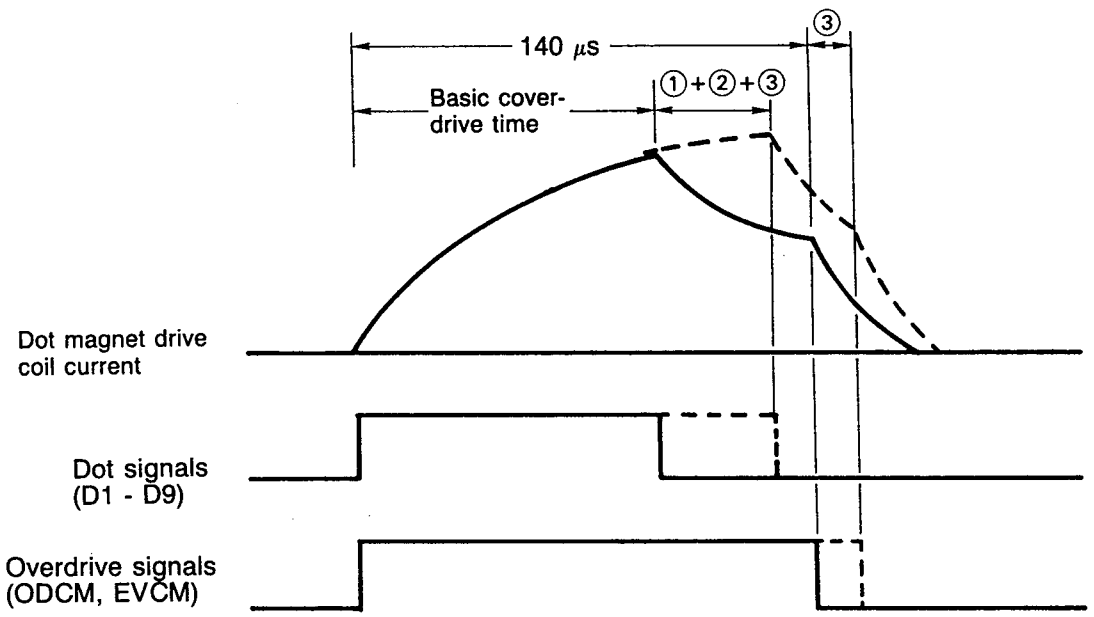
The driving time is corrected according to the number of pins driven at the same time out of 9 pins.

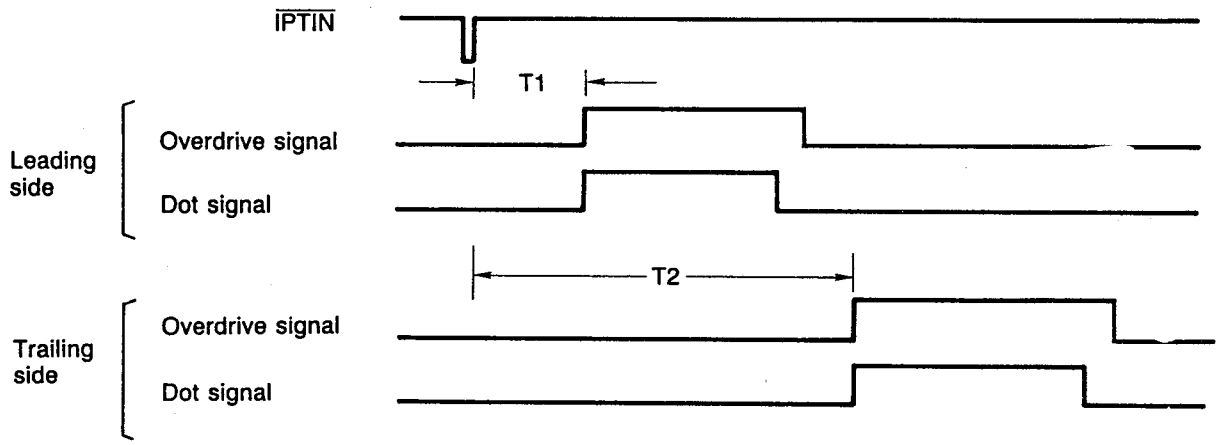
② **Correction for voltage fluctuation**

The driving time is corrected according to the fluctuation of the drive voltage (+38 V). The voltage fluctuation is detected by A/D convertor built in the MPU.

③ **Correction for head gap**

The driving time is corrected according to the head gap.





T1: Drive OFF time
T2: Odd/even pin drive time difference*

* Equals T1, in the modes of simultaneous driving of odd and even pins.

Signals in the above timing diagram correspond to the following signal names in the circuit diagram.

Forward print (Odd pin leading)

	Overdrive signal	Dot signal
Leading	ODCM	D1, D3, D5, D7, D9
Trailing	EVCM	D2, D4, D6, D8

Reverse print (Even pin leading)

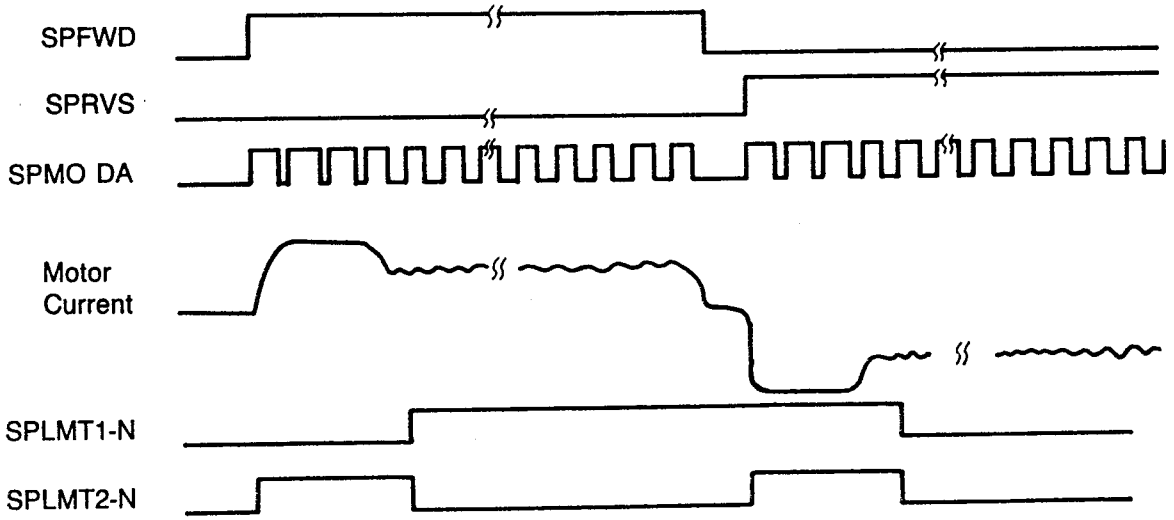
	Overdrive signal	Dot signal
Leading	EVCM	D2, D4, D6, D8
Trailing	ODCM	D1, D3, D5, D7, D9

3.1.2.6 Space motor control

(1) The motor control LSI (Q5) generates the SPMO DA signal (internal use) upon receiving the spacing command from the MPU. This is a fixed cycle pulse signal.

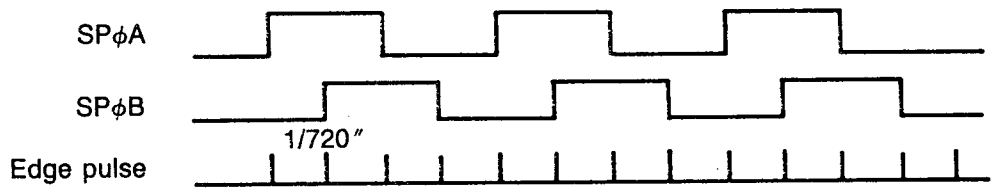
The motor control LSI varies the pulse duty according to the speed data from the MPU to control the motor speed.

The SPFWD or SPRVS signal from the motor control LSI (Q5) changes the current direction in the DC motor to run the motor in the forward or reverse direction.



(2) **Slit encoder**

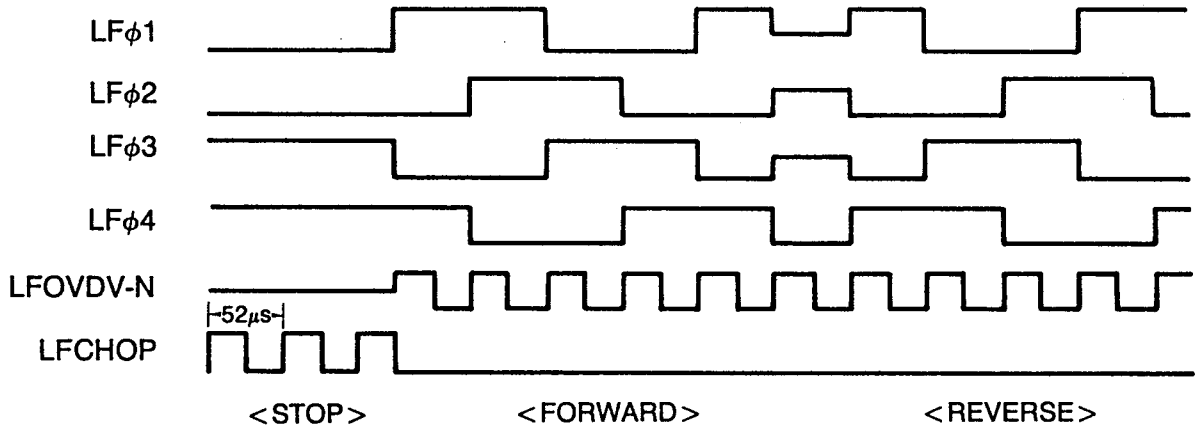
As the space motor rotates, it generates feedback pulse signals SPϕA and SPϕB. The motor control LSI detects the edge pulses from these signals and demultiplies the frequency to output the SLT360 signals as the normalized timing to another LSI to generate head drive timing.



3.1.2.7 Line feed

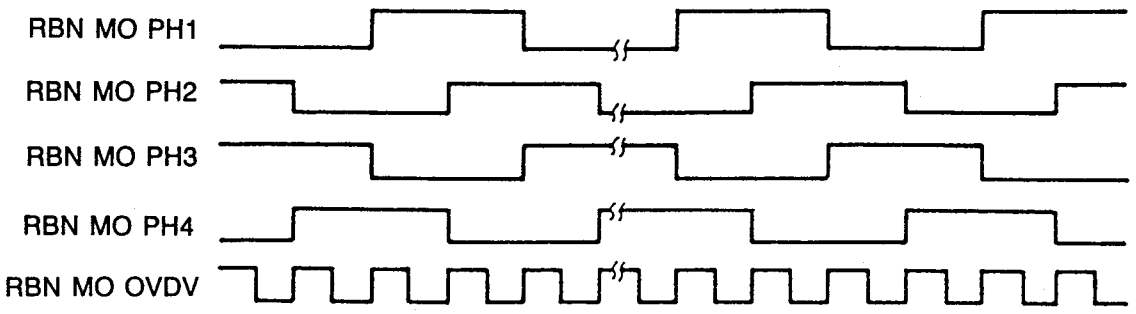
The LF motor is locked by the current supplied from +8 V according to the pulse duty of the LFCHOP signal during the stop period.

It is driven by +38 V application by the LFOVDV-N signal for line feed operation.



3.1.2.8 Bail open/close

The bail motor rotates clockwise to open and close the bail.



3.1.2.9 Alarm circuits

(1) Driver circuit abnormality detection alarm

This protective circuit prevents secondary troubles by stopping the power supply upon detection of an abnormality in the printhead, LF motor or bail motor driver circuit or in the peripheral circuit.

This circuit monitors the driving time by means of the signals (HDE ALM, HDO ALM, LF COM and RBN COM) connected to the overdrive signals for each driver circuit. If any driver circuit driving time exceeds the specified time, the ALM signal is output to switch off the power supply to stop all DC voltage outputs.

(2) Head high temperature alarm circuit

The thermistor built in the head monitors the head temperature for head coil protection.

If high duty printing continues for a long time, the head temperature rises. If it reaches a certain level (approx. 115°C — 125°C), head high temperature alarm 1 is detected to start one-way printing. When head temperature alarm 2 is detected, the printing operation is suspended to wait for the head temperature to fall. When the temperature falls to below the detection temperature, normal printing operation restarts.

As the head temperature rises, the resistance of the thermistor decreases and the potential of the input to the A/D converter built in the MPU falls. When the potential goes below the alarm 1 specific level, MPU goes into alarm 1 procedure. Simultaneously MPU continues to check if the potential goes below alarm 2 specific level. When going below alarm 2 level, MPU goes into alarm 2 procedure.

(3) Paper end detection circuit

Three sensors (continuous form end sensor, bottom paper end sensor and cut-sheet paper end sensor) are provided for different paper set routes to monitor paper end. When paper runs out, the corresponding sensor is turned off to input the CONTINUOUS form end, BOTTOM PE or CUT-SHEET PAPER END signal to the LSI (Q2) or MPU, and is read by the MPU. The MPU stops the printing operation, informs the host of the paper end, and lights the alarm lamp.

(4) Cover open alarm circuit

When the front access cover is opened, the COVOPEN-N signal is input to the LSI (Q2) from the interlocked cover open microswitch, and is then read by the MPU. The MPU stops the printing operation as soon as possible, informs the host that receiving is impossible, and lights the alarm lamp.

3.1.2.10 Sheet Insertion Guide (SIG)

This printer allows temporary use of single sheets when the continuous form is used. It is not necessary to remove the continuous form, but retreat it to the push tractor position and use the single sheets. The first single sheet is automatically fed to the initial position.

Changing from continuous form printing to single sheet printing

State	Operation	Printer operation
SELECT	Press the PARK SET switch.	1. SELECT → DESELECT 2. The continuous form is fed backward until detection of the form end (max. 29 inch) and held at the push tractor.
DESELECT	1. Set the release lever to the CLOSE side. 2. Insert the single sheet. 3. Press the FORM FEED switch.	1. The bail is opened. 2. The single sheet is fed to the initial position (1 inch from the leading edge.) 3. The bail is closed. 4. DESELECT → SELECT (When auto-select is set in Menu setting)
SELECT		Printing on the single sheet is possible.

Changing from single sheet printing to continuous form printing

State	Operation	Printer operation
SELECT	Press the SELECT switch, or wait until single sheet end detection.	SELECT → DESELECT
DESELECT	Press the FORM FEED switch, or continuously depress the LINE FEED switch.	Single sheet ejection
	1. Set the release lever to the OPEN side. 2. Press the FORM FEED switch.	1.The bail is opened. 2.The continuous form is fed to the initial position (1 inch from the leading edge.) 3.The bail is closed. 4.DESELECT → SELECT (When auto-select is set in Menu setting)
SELECT		Printing on the continuous form is possible.

3.2 Mechanical Operation

3.2.1 GENERAL

This printer mainly consists of the printing mechanism unit, control unit and power supply unit. The printing mechanism unit consists of the printhead, spacing mechanism, paper feed mechanism.

Each of these components operates as described below.

3.2.2 Printing Mechanism

(1) Printhead

The printhead has 9 wire dot magnets for printing according to the dot pattern generated in the control unit.

(2) Spacing mechanism

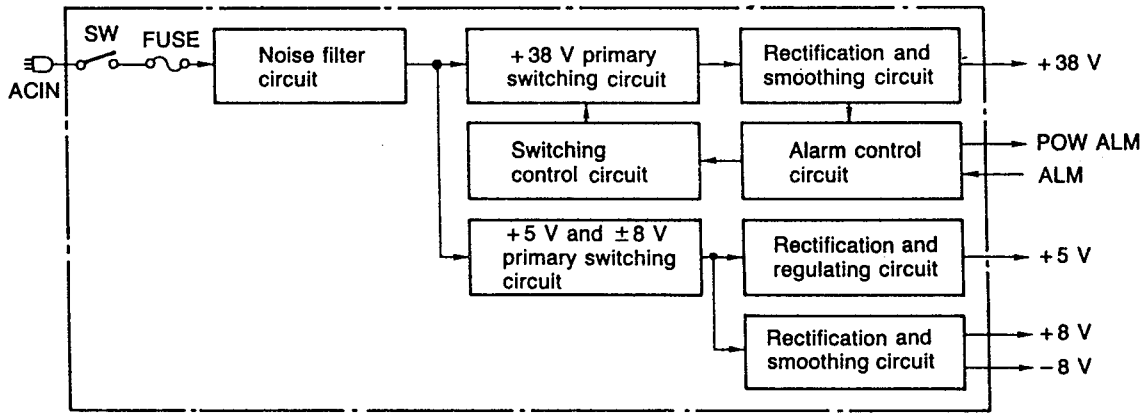
A DC servo motor moves the carriage for spacing, tab and CR.

(3) Line feed mechanism

A stepping motor (LF motor) carries out line feeding operation and feeds the continuous paper or single sheets.

3.1.2.11 Power supply circuit

This switching type power supply circuit supplies the +5 VDC, ±8 VDC and +38 VDC.



The uses of output voltages and signals are described below.

Voltage/signal	Use
+5 V	Logic IC/LED drive voltage
+8 V	Serial interface line voltage and LF motor locking voltage
−8 V	Serial interface line voltage
+38 V	Print head, SP motor, LF motor and bail motor drive voltage
POW ALM	Output from the power supply circuit upon detection of an abnormal temperature rise in the power supply circuit or an overcurrent of +38 V. The control unit suppresses the overcurrent by temporarily suspending printing. If the output does not change, the control unit sets fan alarm.
ALM	Output from the main PCB upon detection of an abnormality in the print head, LF motor or bail motor driver circuit, and shut all DC output off.

3.2.3 Printhead Mechanism and Operation (See Figures 3.1 and 3.2)

The printhead is a spring charge type head using a permanent magnet, and is installed in the carriage moving in parallel with the platen.

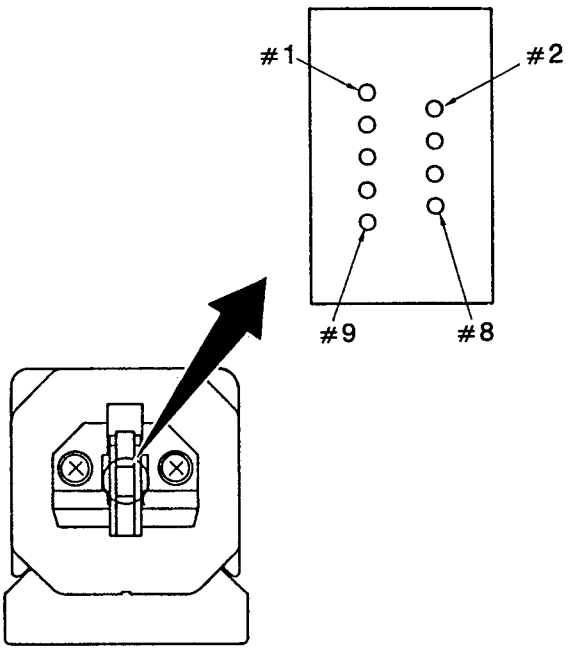


Figure 3.1 Printhead pin arrangement
(View from the front end of printhead)

(1) Printhead operation

The armature is normally pulled to the core by the permanent magnet force against the armature spring force. The wire integrated with the armature is in the reset state. When the magnet coil is excited by the print command from the control unit, a flux in the reverse direction of the permanent magnet force is generated to cause the armature to move away from the core by the force of the armature spring. The wire strikes the platen with the ink ribbon and paper in between to effect printing.

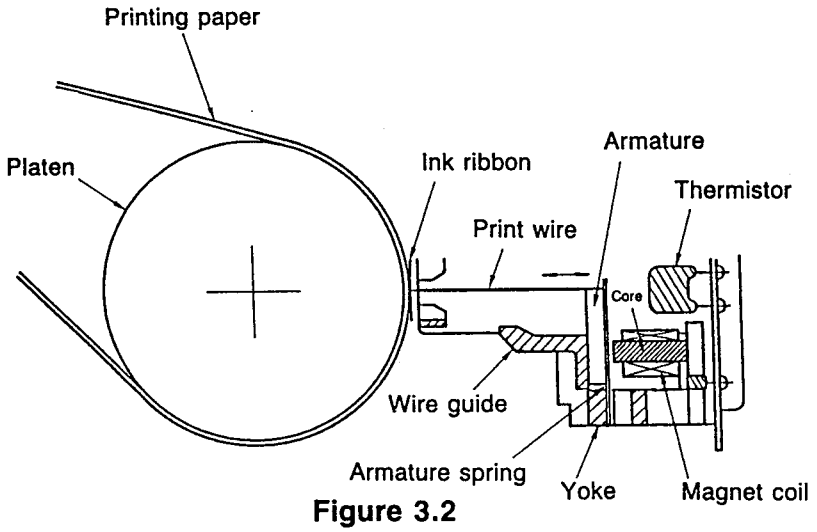


Figure 3.2

3.2.4 Spacing Mechanism and Operation

Spacing is effected by driving the carriage assembly installed to the main shaft and slide beam set in parallel with the platen by the DC servo motor.

(1) Spacing operation (See Figure 3.3)

The carriage mounting the printhead moves in parallel with the platen along the main shaft and slide beam. The carriage is fixed to the mini pitch belt under the carriage frame.

When the DC servo motor runs clockwise as viewed from its rear side, the driving force is transmitted to the mini pitch belt and the carriage moves from the left to the right. The DC servo motor rotating angle and speed are controlled by the count of ϕA and ϕB signals (with a phase difference of about 90°) from the encoder and the time intervals of the signals. The rotating direction is determined by the sign (positive or negative) of the phase difference between ϕA and ϕB.

The mechanism is designed so that the carriage moves 1.6 inches (40.64 mm) when the DC servo motor makes one revolution.

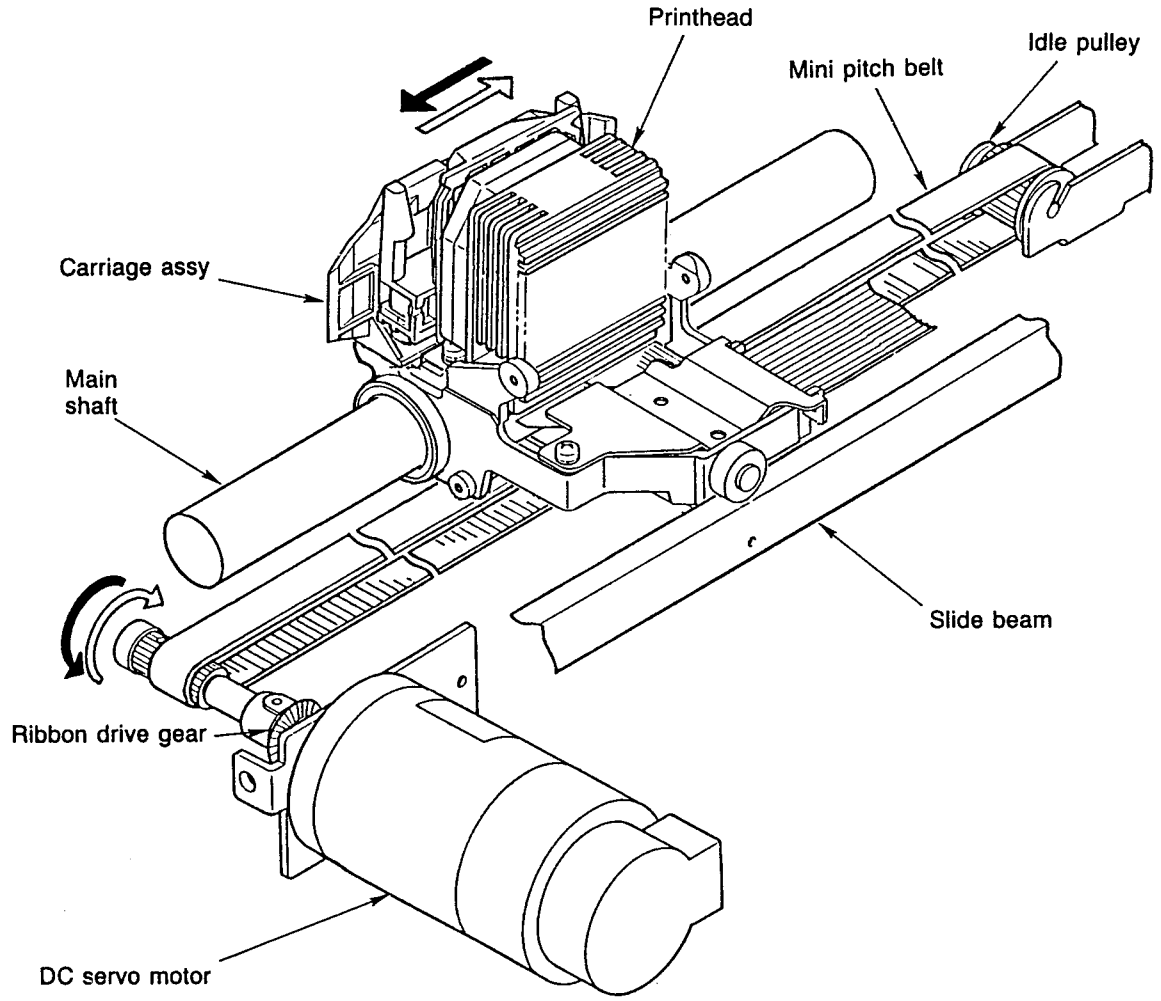


Figure 3.3 Spacing mechanism

3.2.5 Ribbon Feed Mechanism and Operation (See Figure 3.4)

The ribbon feed mechanism feeds the ribbon in synchronization with the spacing operation. The DC servo motor for spacing operation gives the driving force.

(1) Ribbon cartridge

A one-way feed endless ink ribbon is used to obtain consistent print quality.

(2) Feed operation

The ribbon feed mechanism is driven as soon as spacing operation starts although no printing is made and stops after the end of the spacing operation. The space motor rotation is transmitted to the drive roller in the ribbon cartridge via the ribbon feed gear assembly to feed the ribbon.

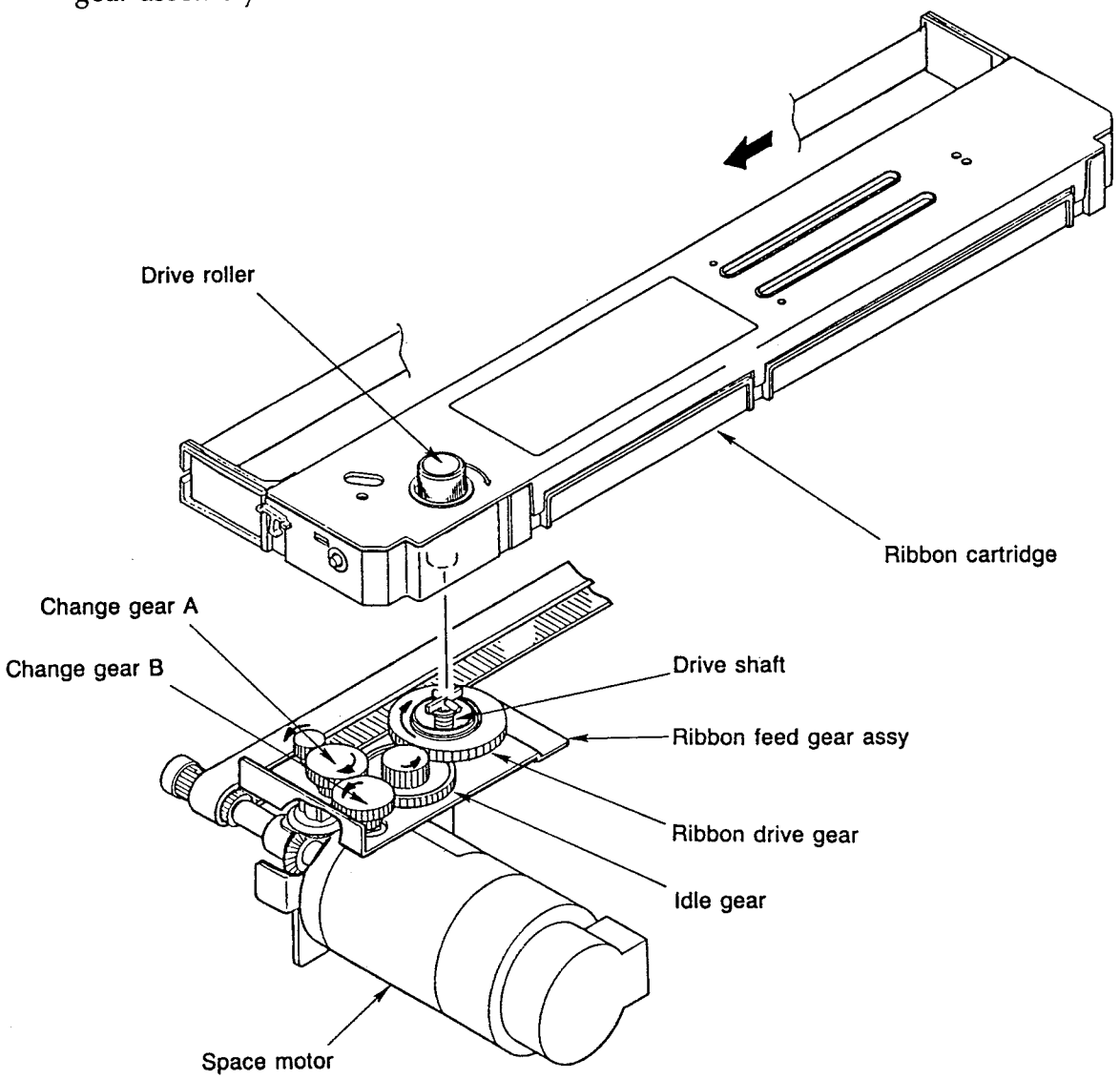


Figure 3.4 Ribbon feed mechanism

3.2.6 Head Gap Adjusting Mechanism and Operation (See Figure 3.5)

The head gap adjusting mechanism adjusts the gap between the platen and the printhead.

This adjustment is necessary to obtain the proper head gap for varied paper thickness.

Adjustment is made with the head gap adjusting lever on the right side of the printer mechanism. The head gap changes as the eccentric cam fixed on both ends of the main shaft rotates.

The adjustment is in 9 stages (1 to 9).

Two microswitches, one on each end of the adjusting lever, allow for three levels of printhead force, depending on paper thickness. Settings one and two for standard paper, three and four for copying paper, and five thru nine for heavy stock or envelopes.

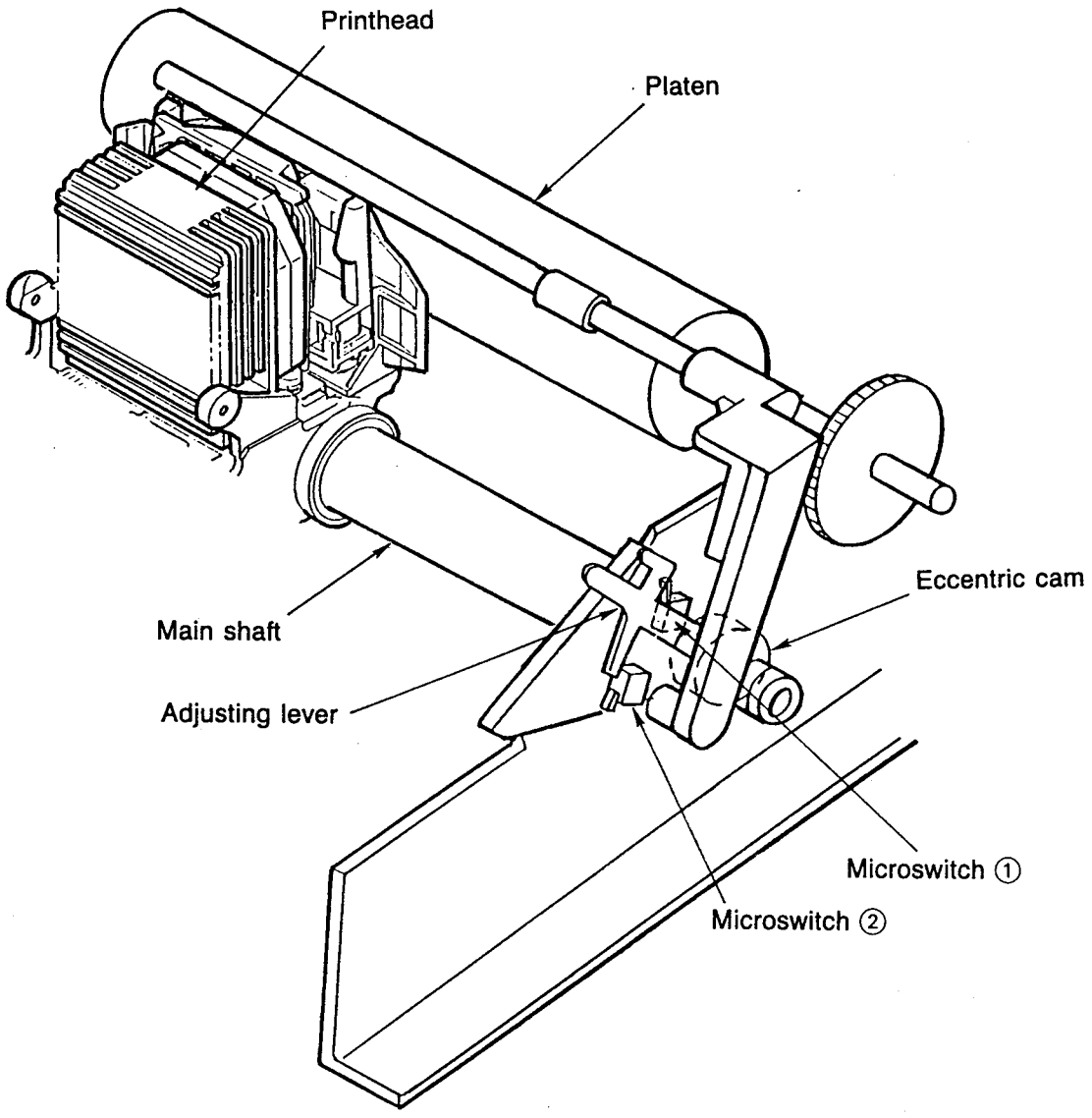


Figure 3.5 Head gap adjusting mechanism

3.2.7 Paper Feed Mechanism and Operation

Line feeding of the printing paper is driven by the LF motor to feed the platen and pin tractor.

(1) Single sheet feeding mechanism (See Figure 3.6)

The LF motor for paper feeding is installed on the left side frame. The motor rotation is transmitted to the platen via the platen pulley.

The mechanism is designed to feed the paper by 0.17 inch (4.23 mm) when the stepping motor rotates 60 steps. The minimum feed rate is for one step of the LF motor or 0.03 inch (0.07 mm).

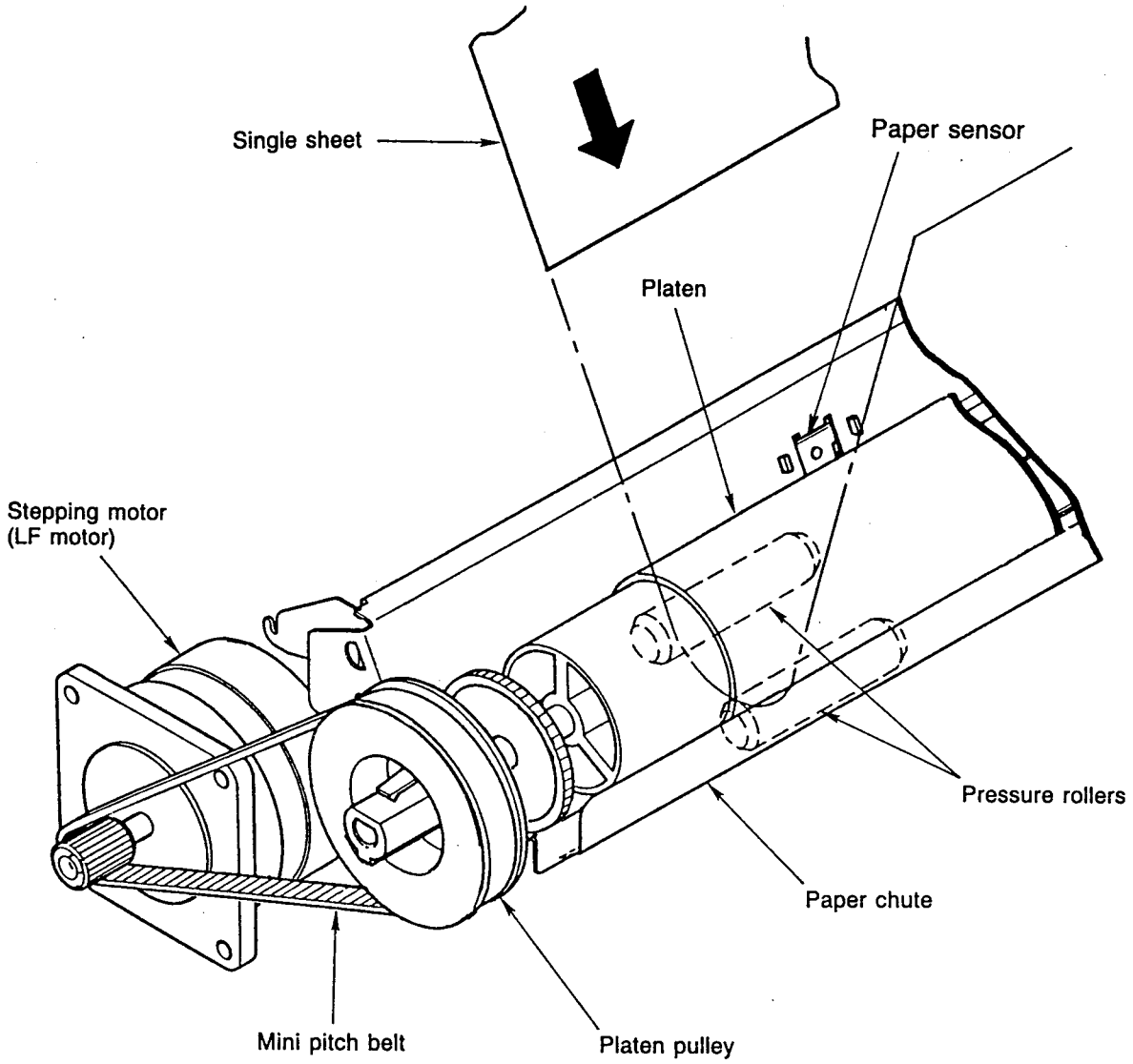


Figure 3.6 Single sheet feeding mechanism

(2) **Continuous form feeding mechanism (See Figure 3.7)**

The power transmitted to the platen as described in (1) (single sheet feeding operation) rotates drive gears A and B by way of the platen gear at the right end of the platen and the idle gear.

As drive gears A and B rotate, the pin wheels and pin tractor belts are rotated via two sheet feeder shafts to cause the continuous form to be fed.

In the push tractor method, the form can be cut at about 1 inch after the end of printing.

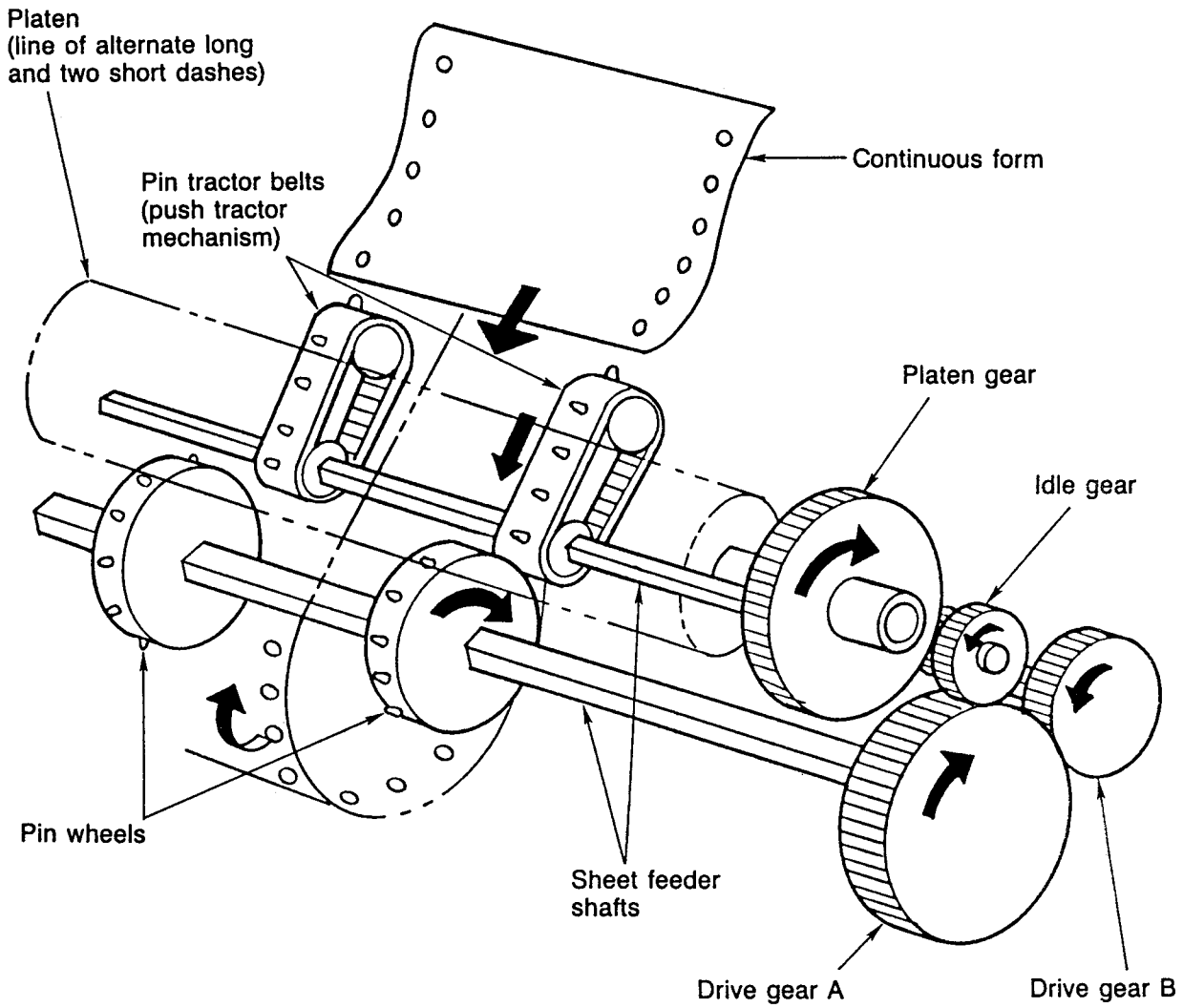


Figure 3.7 Continuous form feeding mechanism

(3) **Single sheet and continuous form selection mechanism (See Figure 3.8)**

Selection between the single sheet and continuous form is made by using the paper release lever on the right side of the printer mechanism.

Push the paper release lever backward. The idle gear is raised toward the right and the driving force transmission from the platen gear to drive gears A and B is disconnected, so the pin tractors interlocked with drive gear B are stopped.

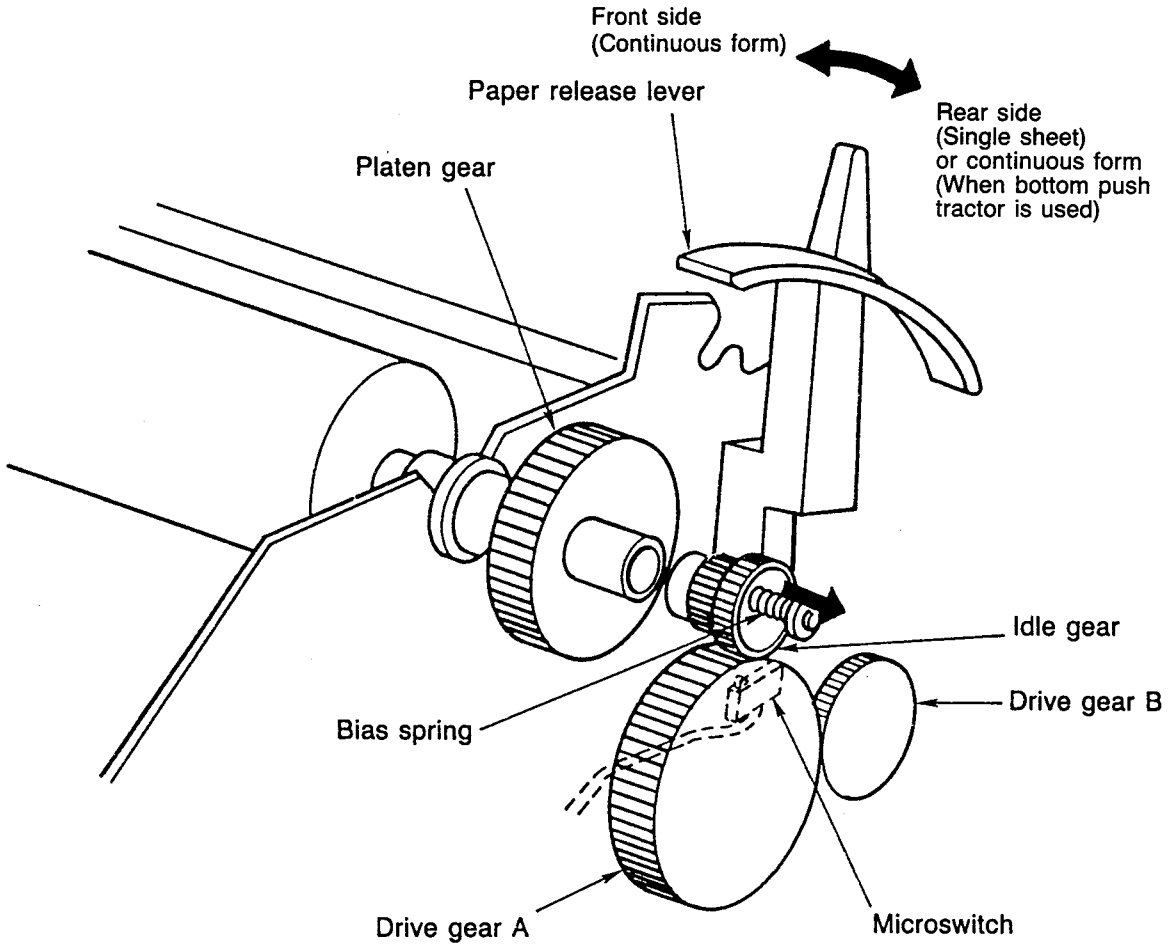


Figure 3.8 Single sheet and continuous form selection

As a result, the single sheet is fed by platen rotation but the continuous form on the pin tractors is not fed.

When the paper release lever is pulled forward, the idle gear is forced to the bias spring and moves in the reverse direction of the arrow. Therefore, platen gear rotation is transmitted to drive gears A and B to cause feeding of the continuous form.

A microswitch is installed under the paper release lever to detect the paper release lever set position. It is used for the control of paper feeding in automatic loading.

(4) Bottom push tractor mechanism (option) (See Figure 3.9.)

The bottom push tractor is driven by the LF-motor (pulse motor) in the bottom push tractor. Motor power is relayed to the drive shaft via the mini-pitch belt and this shaft feeds the paper to the printer unit.

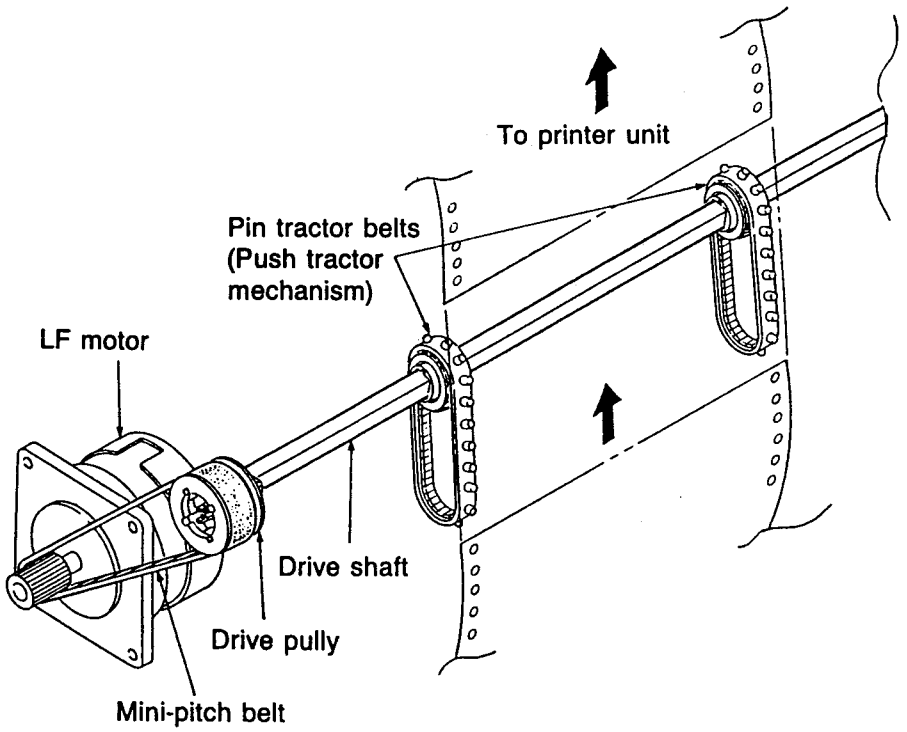


Figure 3.9 Bottom push tractor mechanism

(5) **Push-pull tractor mechanism (Option) (See Figure 3.10)**

This mechanism consists of the optional pull tractor mechanism and the standard push tractor mechanism.

This mechanism is used for forward and reverse feeding of the continuous form by setting it to the push and pull tractor mechanisms.

The platen pulley rotation is transmitted to the push tractor mechanism and pull tractor unit to cause form feeding at these two places. Actually the operations described in (3) and (4) above are carried out concurrently. Adjustment to eliminate slackness on the push and pull tractor mechanisms is necessary before starting continuous form feeding.

When the drive gear is pushed leftward (in the direction of the black arrow ⬅), the drive gear and idle gear are disengaged to rotate only the pin tractor in the pull tractor. This makes it possible to eliminate the slackness of the form.

After adjustment is completed, the spring force pushes the drive gear to the right in the direction of the white arrow ⇨) to reengage it with the idle gear, thus enabling form feeding.

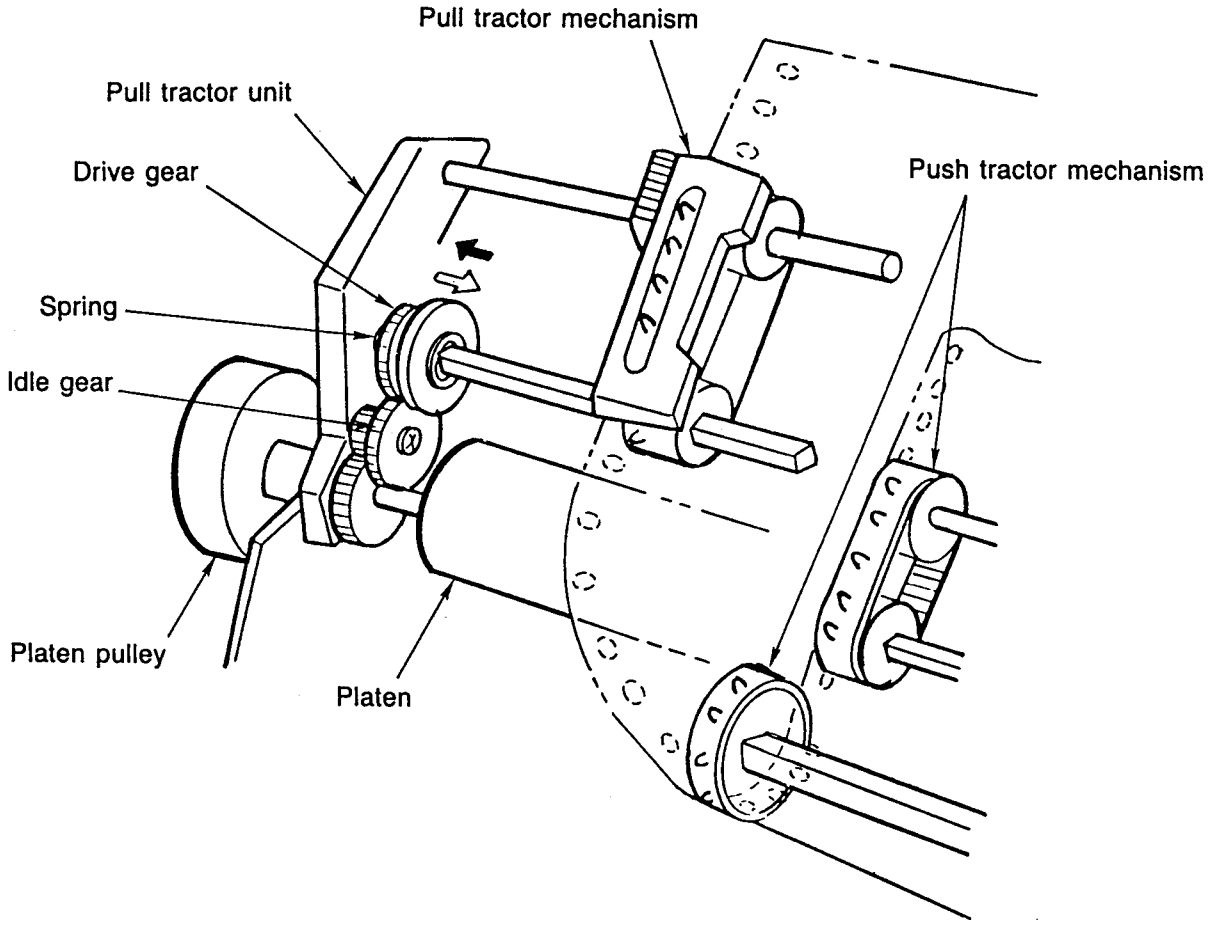


Figure 3.10 Push-pull tractor mechanism

3.2.8 Paper End Detection Mechanism (See Figure 3.11)

(1) **Rear form end detection mechanism** (when the form with sprocket holes is used)

The form prevents the paper end lever tip end from coming into the hole on the sheet feeder cover rib and the microswitch is set to the ON state. When the form runs out, the paper end lever comes into the hole on the sheet feeder cover rib and the bottom of the paper end lever leaves the microswitch to turn it off for form end detection. The form end state is detected when the remaining form length from the printing position is down to 5.78 inches (147 mm).

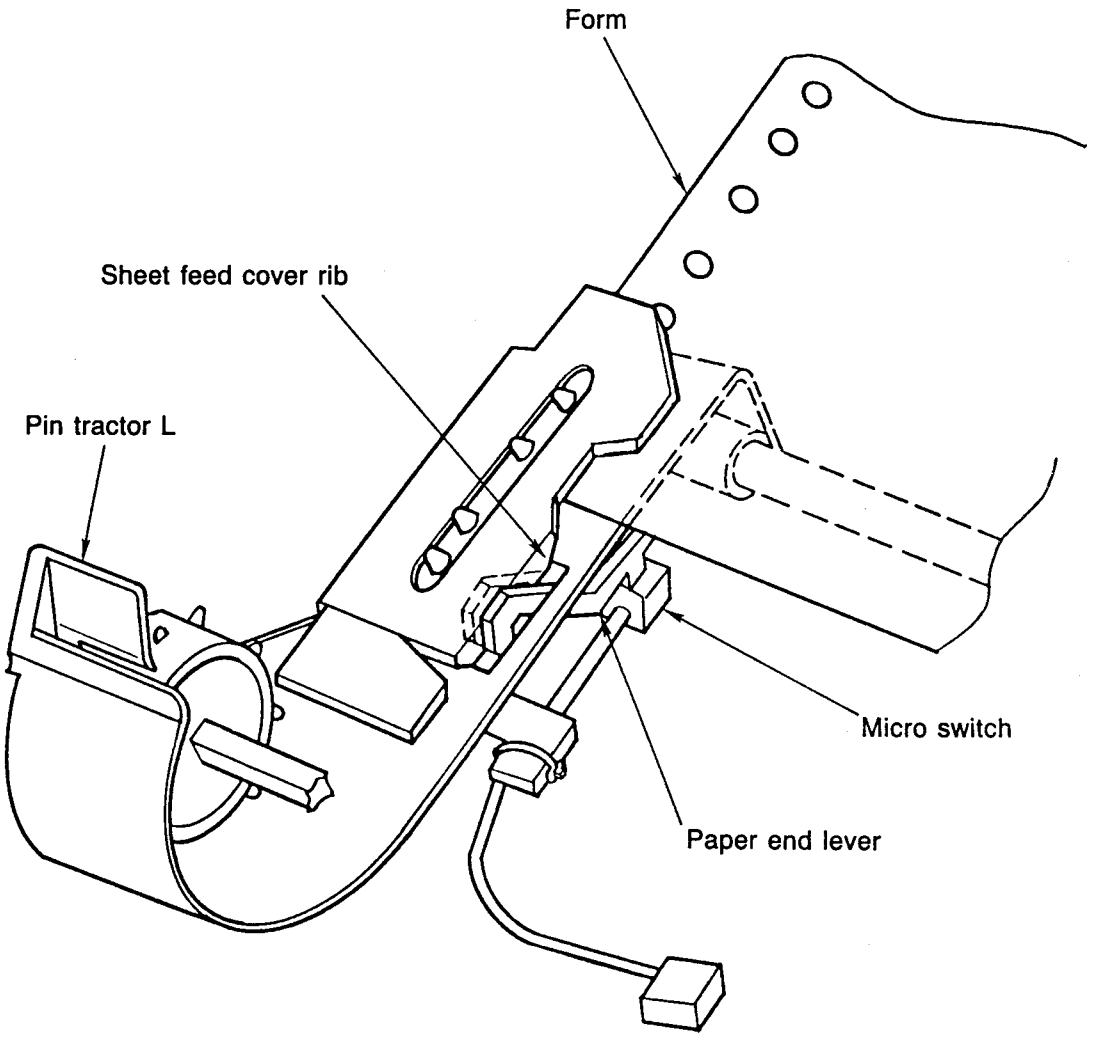


Figure 3.11 Rear form end detection mechanism

(2) **Bottom paper end detection mechanism (See Figure 3.12)**

When the paper exists, the paper prevents the tip end of the bottom paper end lever from coming into the hole on the main frame and the sensor is in the ON state. When the paper runs out, the bottom paper end lever comes into the hole on the main frame. At the same time, the other end of the bottom paper end lever shields the sensor to provide the OFF state for bottom paper end detection. The bottom paper end is detected when the remaining paper length from the current printing position becomes approx. 2.36 inches (60 mm).

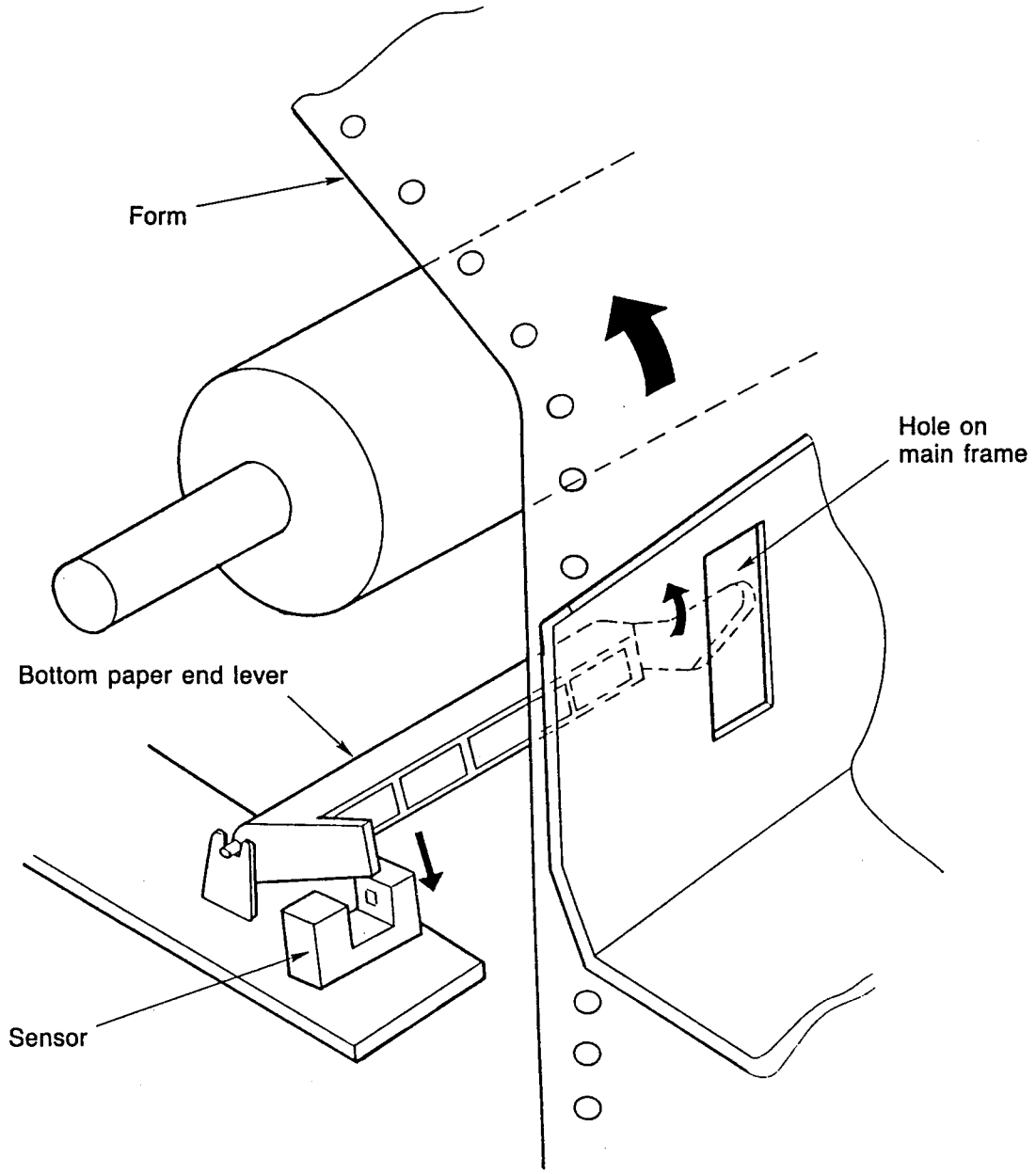


Figure 3.12 Bottom paper end detection mechanism

4. ASSEMBLY/DISASSEMBLY

4. ASSEMBLY/DISASSEMBLY

This section explains the procedures for removing and installing various assemblies and units in the field.

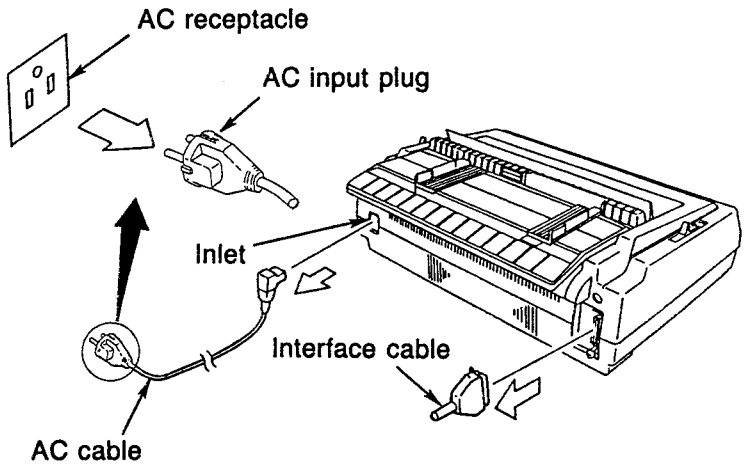
Description is mainly limited to the removal procedure; installation should basically be performed in the reverse sequence of the removal procedure.

4.1 Precautions for Parts Replacement

(1) Remove the AC cable and the interface cable before disassembling or assembling.

(a) Turn off the AC power switch. Remove the AC input plug of the AC cable from the receptacle. Remove the AC cable from the inlet on the printer.

(b) To connect the AC cable again, connect it to the inlet on the printer first, then insert the AC input plug into a receptacle.



(2) Do not disassemble the printer as long as it is operating normally.

(3) Do not remove unnecessary parts, and limit the disassembly area as small as possible.

(4) Use the designated service tools.

(5) Carry out disassembly in the prescribed sequence; otherwise, damage to the parts may result.

(6) It is advisable to temporarily install screws, snap rings and other small parts in their original positions to avoid losing them.

(7) Whenever handling the microprocessors, ROM, RAM IC chips and boards, do not use gloves which may cause static electricity.

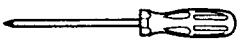
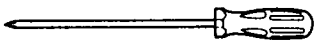
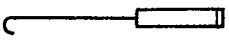
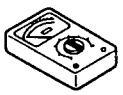
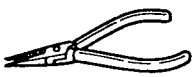
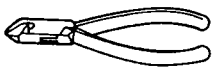
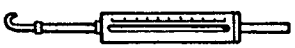
(8) Do not place the printed circuit board directly on the equipment or on the floor.

(9) If adjustment is specified in the middle of installation, follow the instructions.

4.2. SERVICE TOOLS

Table 4.1 lists the tools necessary for replacing printed circuit boards and parts of units in the field.

Table 4.1 Service tools

No.	Service tool		Q'ty	Use	Remarks
1		No. 1-100 Phillips screwdriver	1	Screws 2.6 mm	
2		No. 2-200 Phillips screwdriver	1	Screws 3 - 5 mm	
3		No. 3-100 screwdriver	1		
4		Spring hook	1		
5		7 mm wrench	1		
6		Volt/ohmmeter	1		
7		Feeler gauge	1	Head gap adjustment	
8		Pliers	1		
9		No. 5 nippers	1		
10		1.1 lbs (500 g) bar pressure gauge	1		

4.3 Disassembly/Reassembly of Procedure

This section explains the assembly replacement procedures according to the following disassembly system.

[Parts Layout]

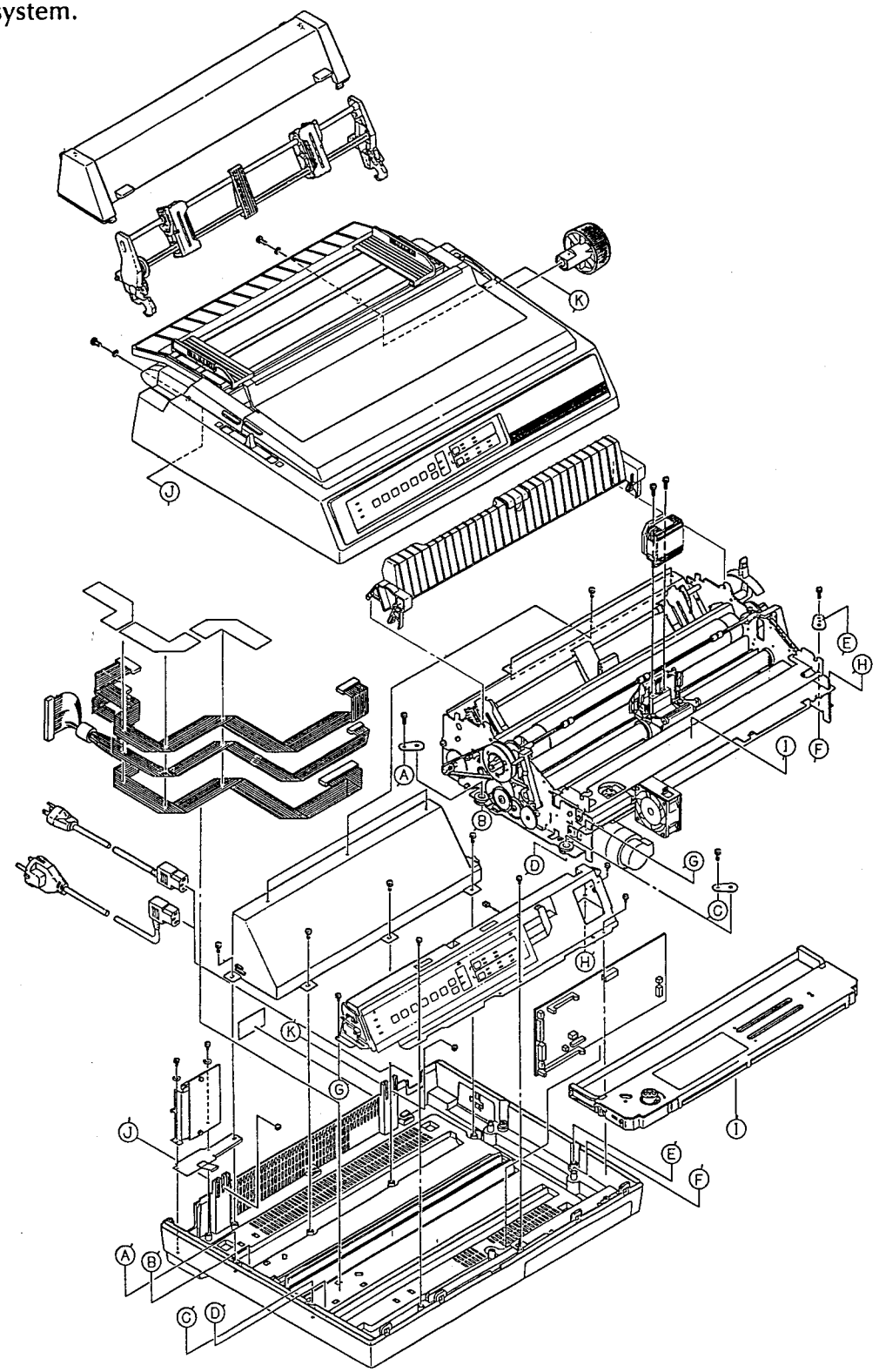
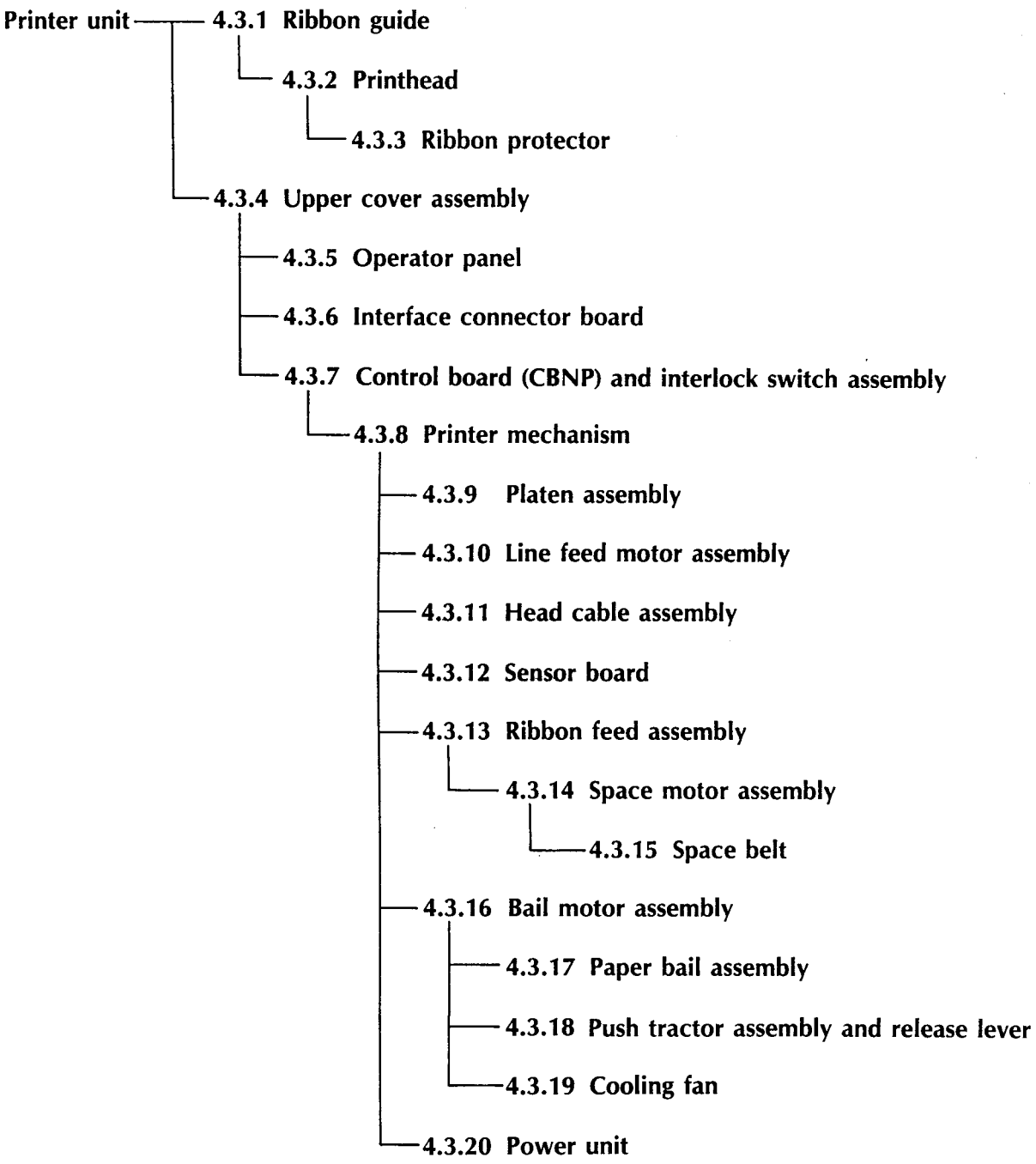


Figure 4.1

[How to Change Parts]

This section explains how to change parts and assemblies appearing in the disassembly diagram below.



4.3.1 Ribbon Guide

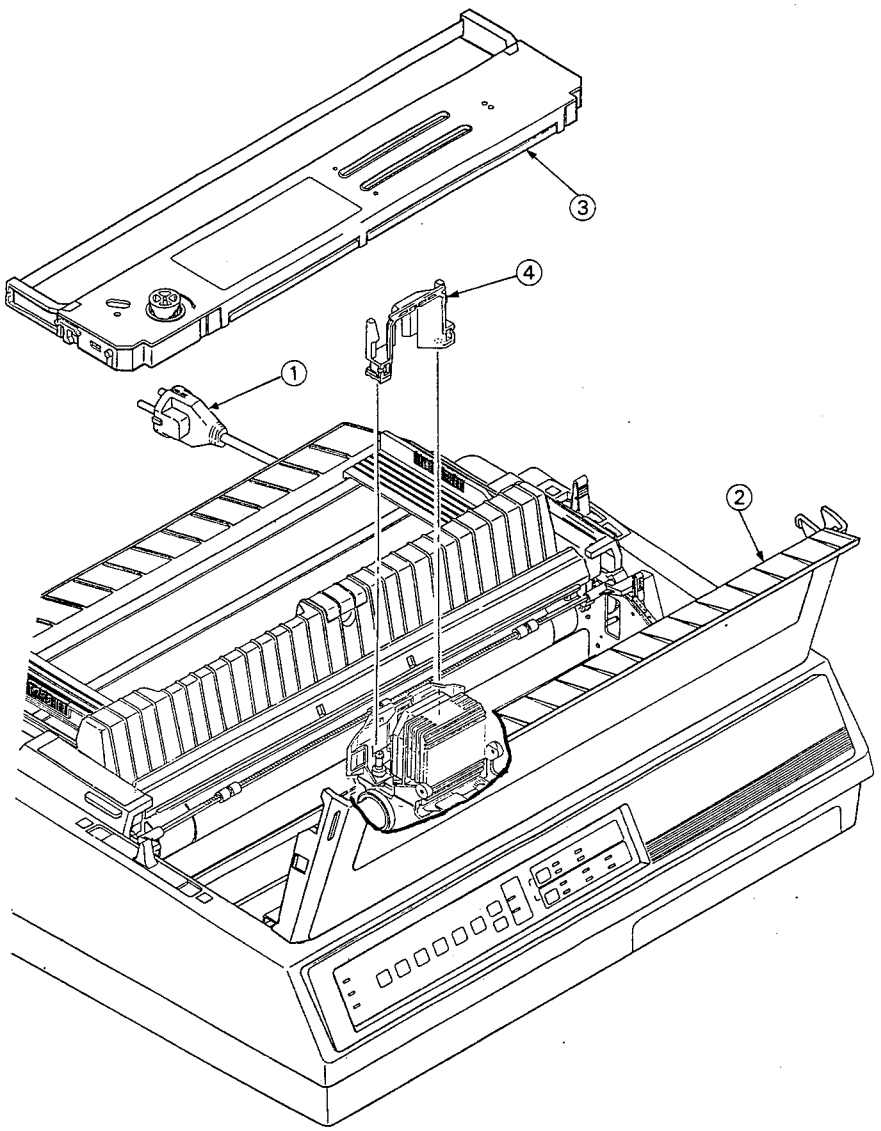
(1) Turn OFF the AC POWER switch, and remove AC cord ① from the receptacle.

(2) Open access cover ② .

(3) Remove ribbon cartridge ③ .

(4) Remove ribbon guide ④ .

(5) To install, reverse the removal procedure sequence.



4.3.2 Printhead

[Caution]

The printhead may be hot immediately after printing.

(1) Remove the Ribbon Guide (See section 4.3.1).

(2) Pull down head gap adjusting lever ① to the front range (range 9 position).

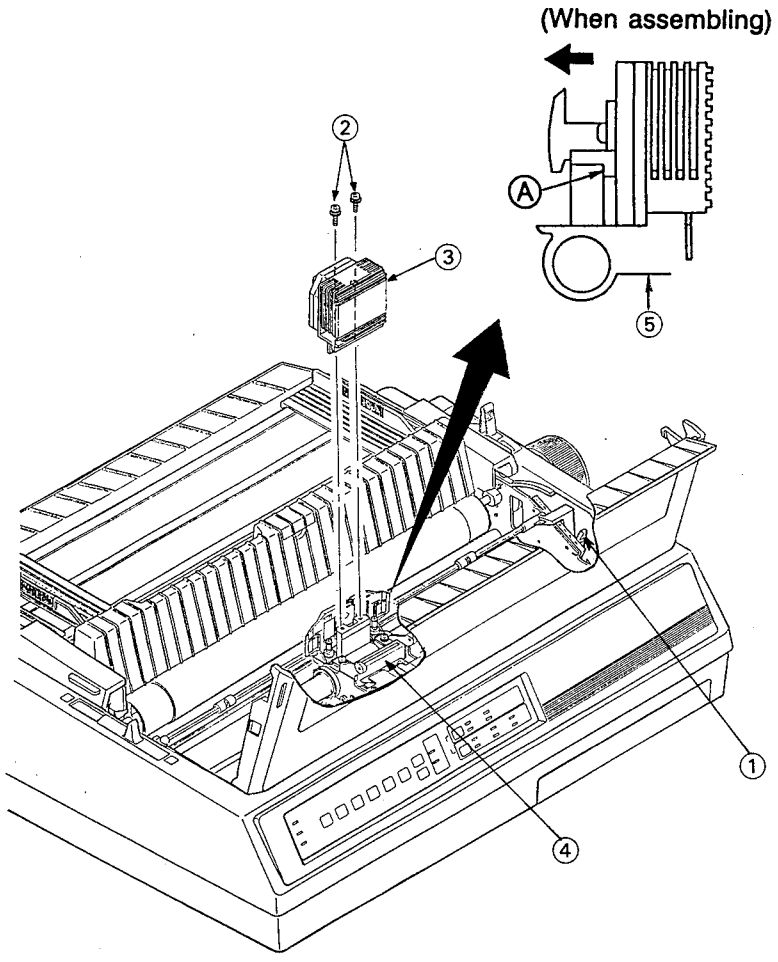
(3) Remove two screws ② , and disconnect printhead ③ from connector ④ by lifting up vertically.

(4) To install, reverse the removal procedures sequence.

[Notes on installation]

(1) Install printhead ③ while pressing it in the direction of the arrow so that it will contact tightly the surface Ⓐ of carriage frame ⑤ .

(2) Be sure to check the gap between platen and printhead (See Section 5.1).



4.3.3 Ribbon Protector

(1) Remove the printhead. (See section 4.3.2.).

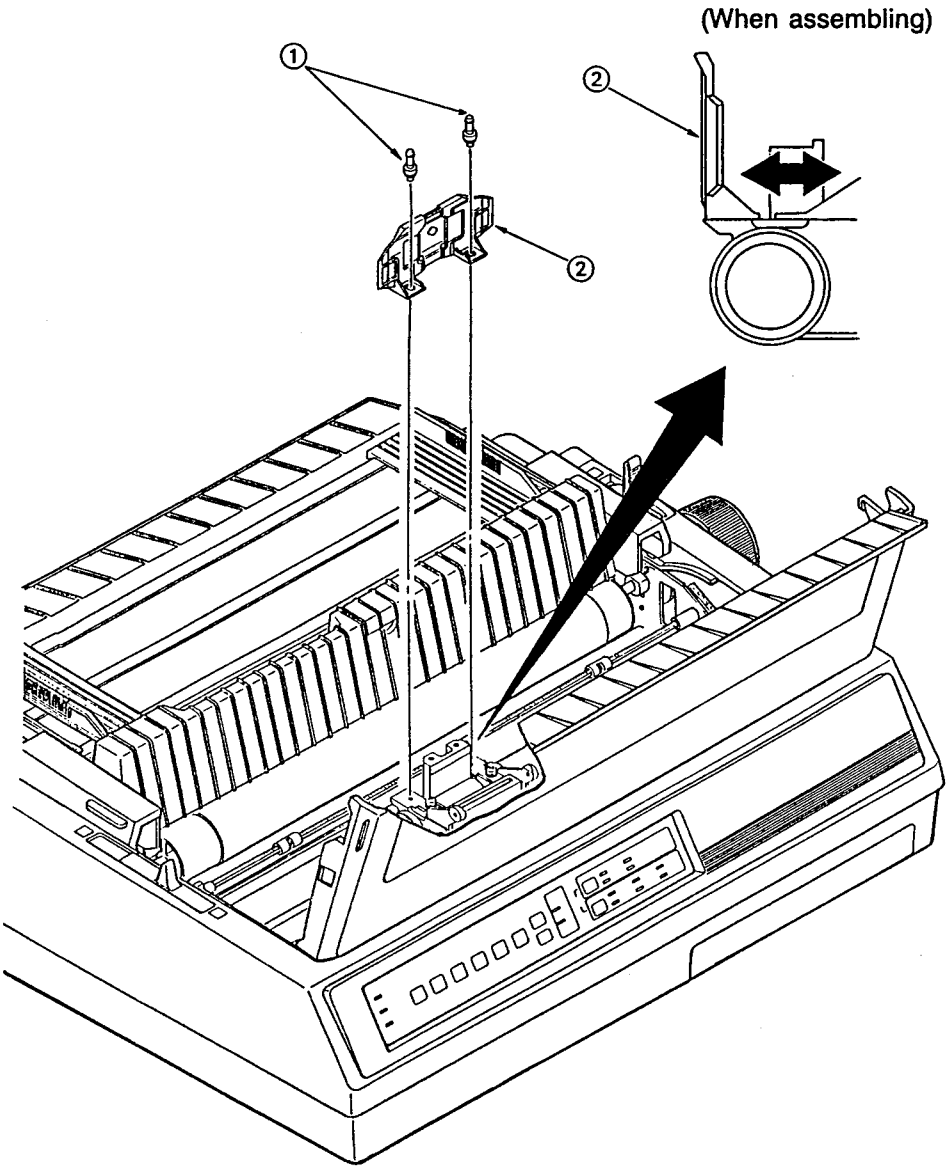
(2) Remove two ribbon guide posts ① , then remove ribbon protector ② by lifting up.

(3) To install, reverse the removal procedure sequence.

[Notes on installation]

(1) Align the printhead center with the center of the ribbon protector hole.

(2) Insure ribbon guide post base is in hole of ribbon protector.



4.3.4 Upper Cover Assembly

(1) Set the AC POWER switch to OFF and pull out the AC plug ① from the receptacle.

(2) Disconnect interface cable ② .

(3) Pull out platen knob ③ .

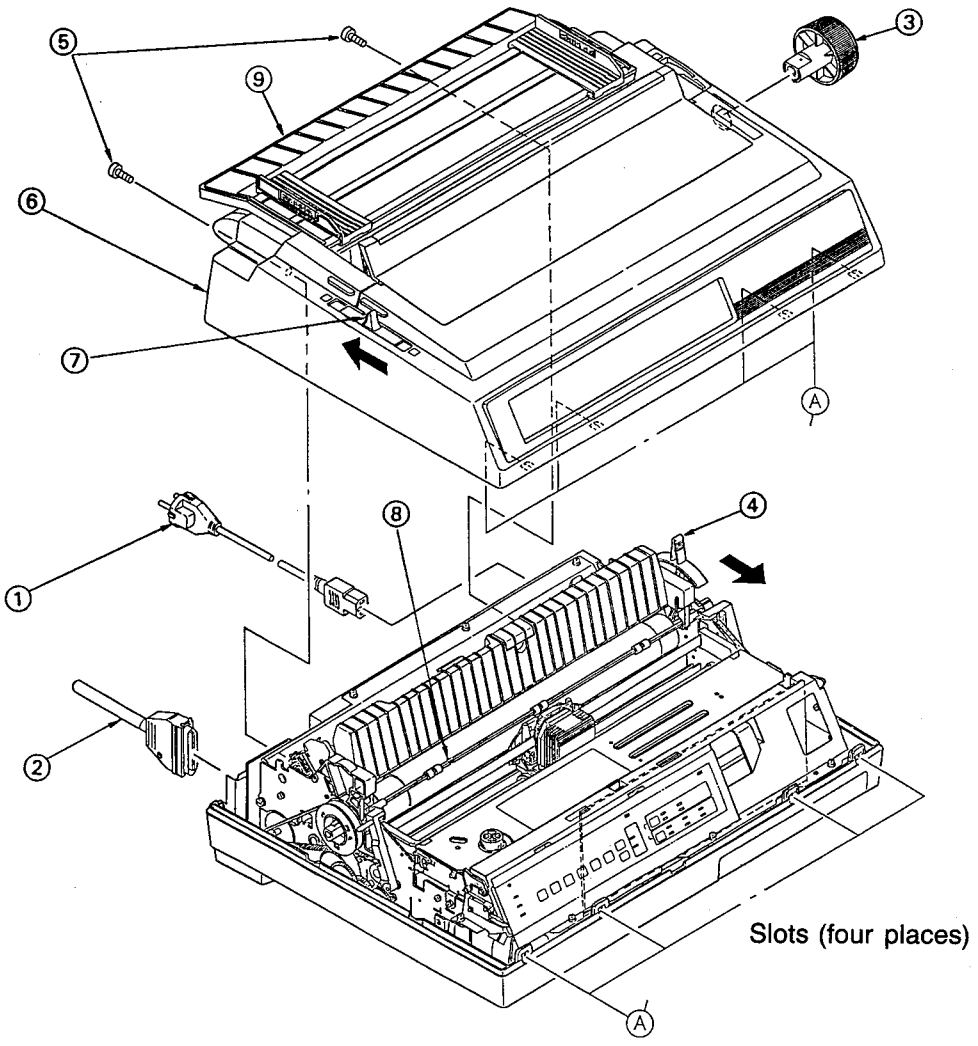
(4) Turn release lever ④ forward.

(5) Remove two screws ⑤ in the rear of the printer. First lift rear cover assembly ⑨ to upright position, then lift the rear end of upper cover assembly ⑥ on the front part and slide it toward the front to take it off from the four slots. Then remove the whole upper cover assembly by lifting it vertically.

(6) To install, reverse the removal procedure sequence.

[Note on installation]

(1) At installation of the upper cover assembly, turn bail open lever ⑦ backward. Confirm that the paper bail ⑧ moves according to the bail open lever after installation.



4.3.5 Operator Panel

(1) Remove the upper cover. (See section 4.3.4.)

(2) Disconnect cable ① of operator panel ⑦ from connector CN10 ③ of control board ② . (Pull the locking piece ⑧ by arrow ⓐ to remove.)

(3) Remove two screws ④ .

(4) Remove the operator panel holder ⑤ by moving it upward, and then pulling to the front.

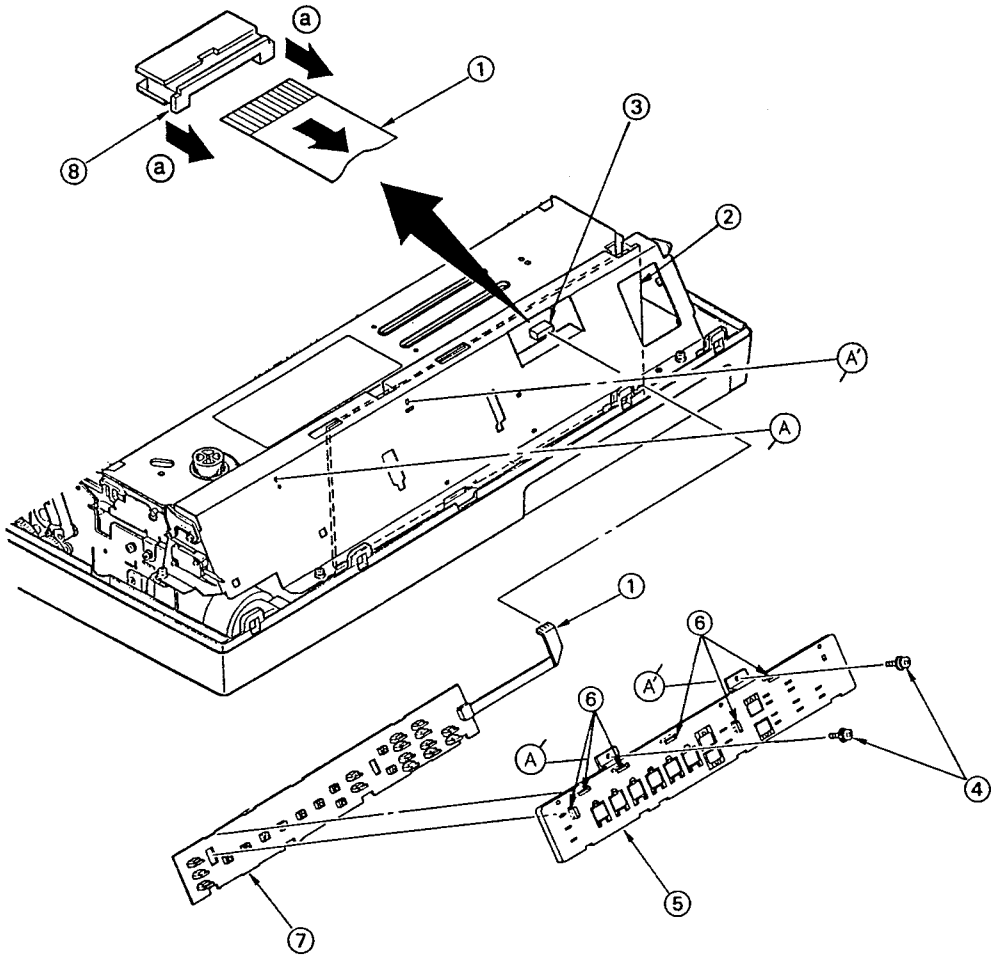
(5) Release six locked parts ⑥ . (If replacing operator panel assy, ignore steps (5) ,(6) .)

(6) Remove operator panel ⑦ from operator panel holder ⑤ .

(7) To install, reverse the removal procedure sequence.

[Note on installation]

(1) Insert the cable ① to the connector ③ and insert the locking piece ⑧ in the reversed direction of arrow ⓐ to fix the cable ① .



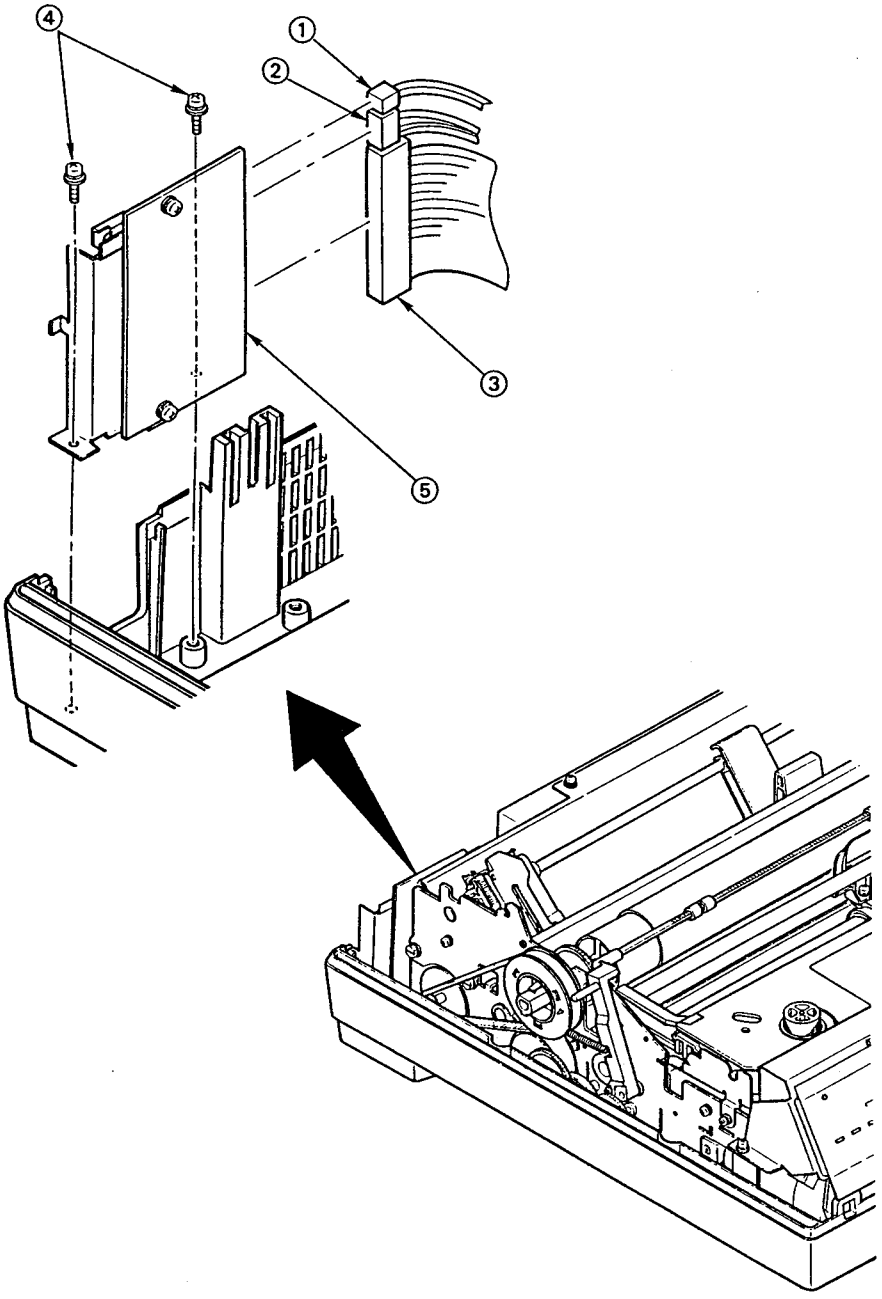
4.3.6 Interface Connector Board

(1) Remove the upper cover. (See section 4.3.4.)

(2) Disconnect cables ① , ② and ③ .

(3) Remove two screws ④ , and remove interface connector board ⑤ upward.

(4) To install, reverse the removal procedure sequence.



4.3.7 Control Board (CBNP) and Interlock Switch Assembly

(1) Remove the upper cover. (See section 4.3.4.)

(2) Remove ribbon cartridge ① .

(3) Release the lock of contrtol board connector CN10 ② , and pull out cable ③ .

(4) Remove five screws ⑥ , and remove shield cover assembly ⑦ , then cables ④ and ⑤ .

(5) Loosen set screw ⑧ (behind board), and remove all connectors (CN1 to 9) from control board ⑨ while lifting it slightly.

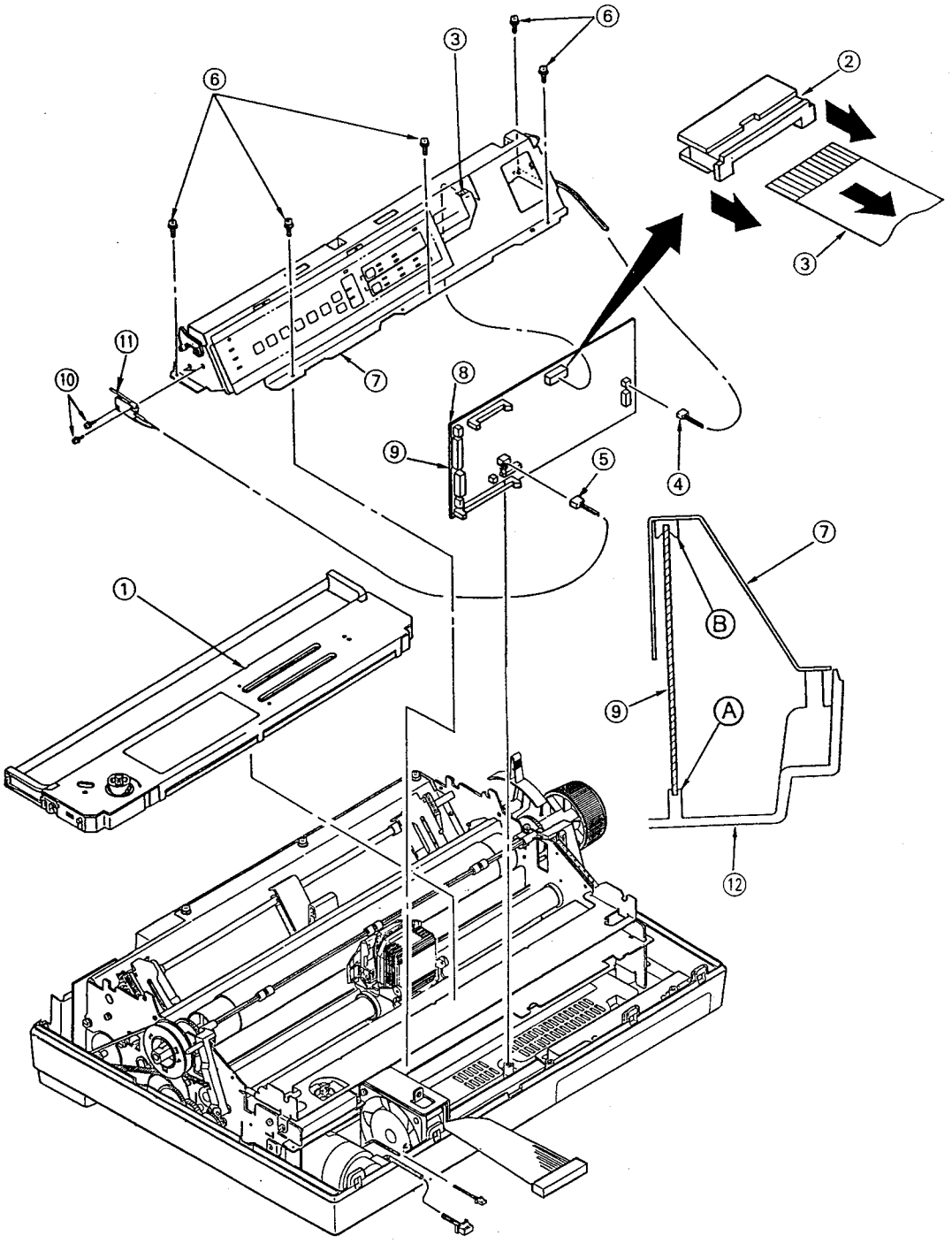
(6) Remove control board ⑨ upward.

(7) Remove two screws ⑩ , and remove interlock switch assembly ⑪ .

(8) To install, reverse the removal installation procedure sequence.

[Notes on installation]

(1) Do not allow the connecting cable to be caught under control board ⑨ .
(2) Insert control board ⑨ in groove Ⓐ on lower cover ⑫ , and butt it on the right before tightening the set screw.
(3) Before fixing the shield cover, fit control board ⑨ in groove Ⓑ on left and right sides.


6
3
6
2
6
3
11
10
7
8
9
5
4
7
1
B
9
A
12

4.3.8 Printer Mechanism

(1) Remove the control board (CBNP). (See section 4.3.7)

(2) Disconnect cables CN102 ② and CN103 ③ connected to interface connector board ① .

(3) Remove three screws ④ .

(4) Remove three screws ⑤ , and remove fitting ⑥ (three places).

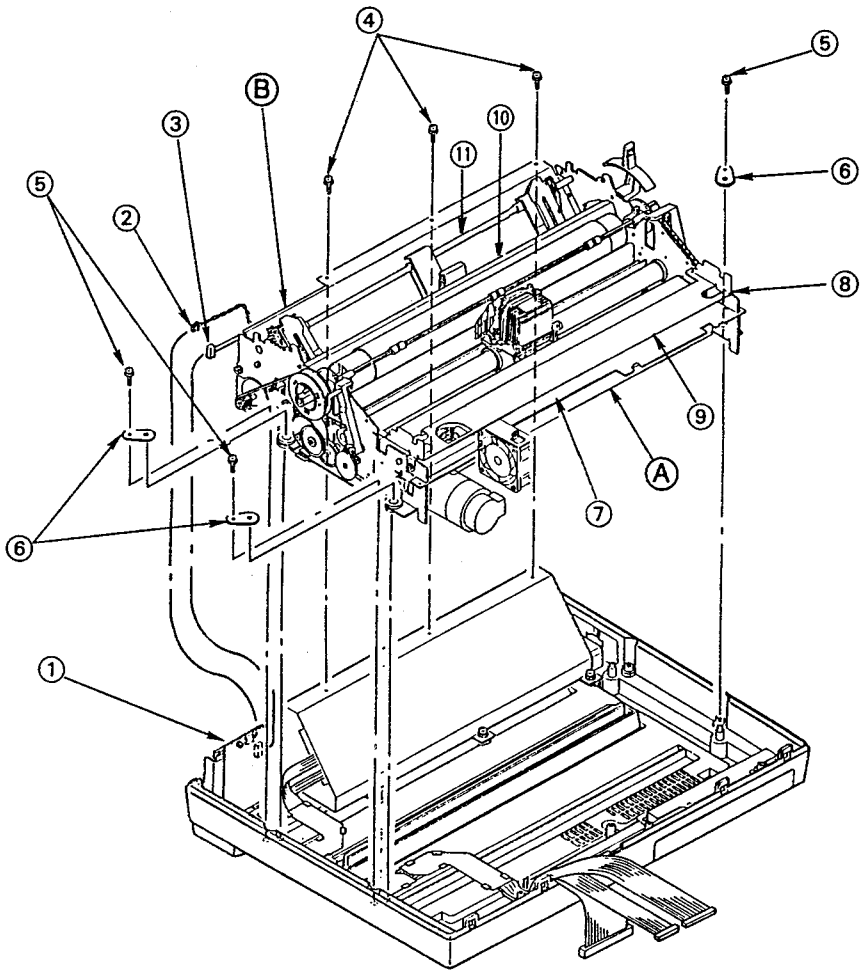
(5) Holding the front side (portion Ⓐ) and rear side (portion Ⓑ) of base frame ⑦ , lift it up vertically for removing printer mechanism ⑧ .

Do not hold ribbon cartridge bracket ⑨ , paper chute ⑩ and guide shaft A ⑪ of the sheet feeder assembly when removing printer mechanism ⑧ .

(6) To install, reverse the removal procedure sequence.

[Note on installation]

(1) Do not allow the cables and connectors to be caught under printer mechanism.



4.3.9 Platen Assembly

(1) Remove the printer mechanism. (See section 4.3.8.)

(2) Loosen three bolts ① , move LF motor ② close to platen assembly ⑮ , and remove line feed belt ③ .

(3) Remove "E" snap ring ④ , and remove washer A ⑤ , spring ⑥ and idle gear ⑦ .

(4) Remove screw ⑧ , and remove platen pulley ⑨ , washer B ⑩ and bearing ⑪ .

(5) Remove screw ⑫ , and remove gear ⑬ and bearing ⑭ .

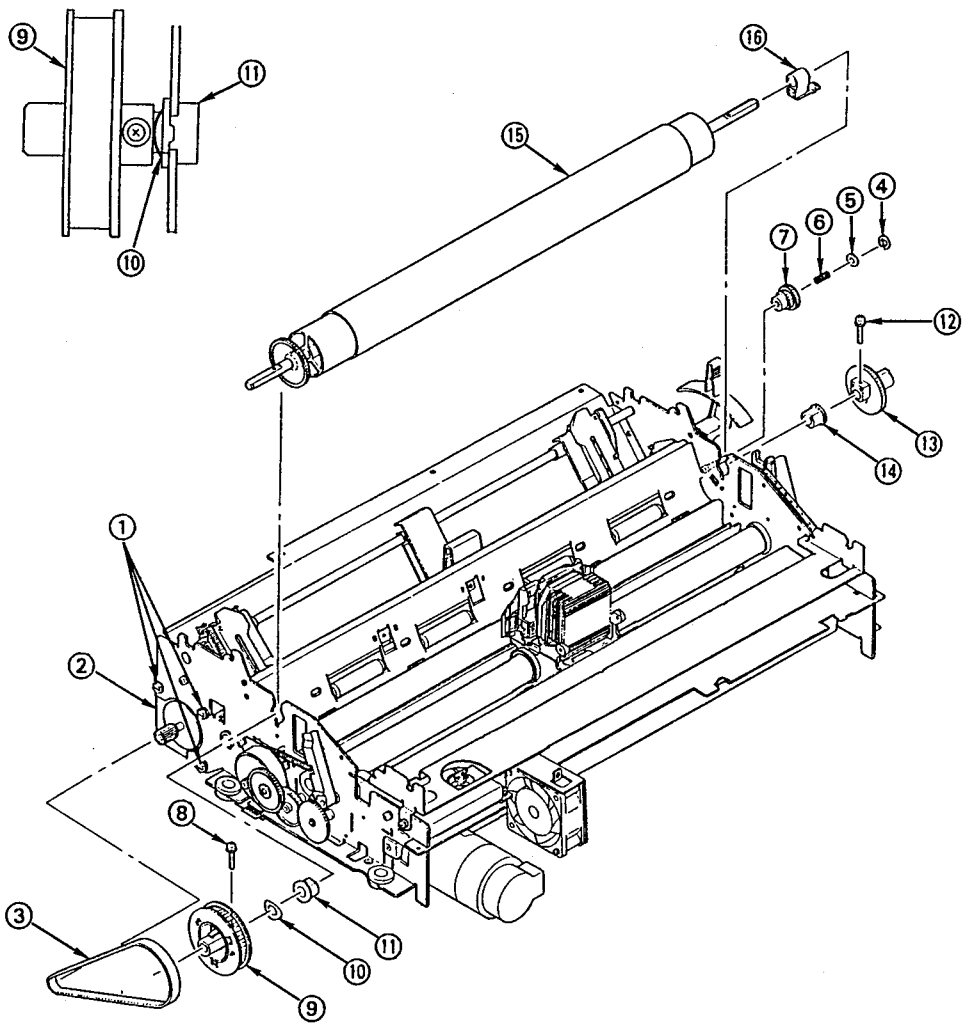
(6) Take out the platen assembly ⑮ and platen lever ⑯ .

(7) Remove platen lever ⑯ .

(8) To install, reverse the removal procedure sequence.

[Notes on installation]

(1) Be sure to install correctly washer B ⑩ .
(2) Be sure to adjust the belt tension after installing line feed belt ③ . (See section 5.4.)



4.3.10 Line Feed Motor Assembly

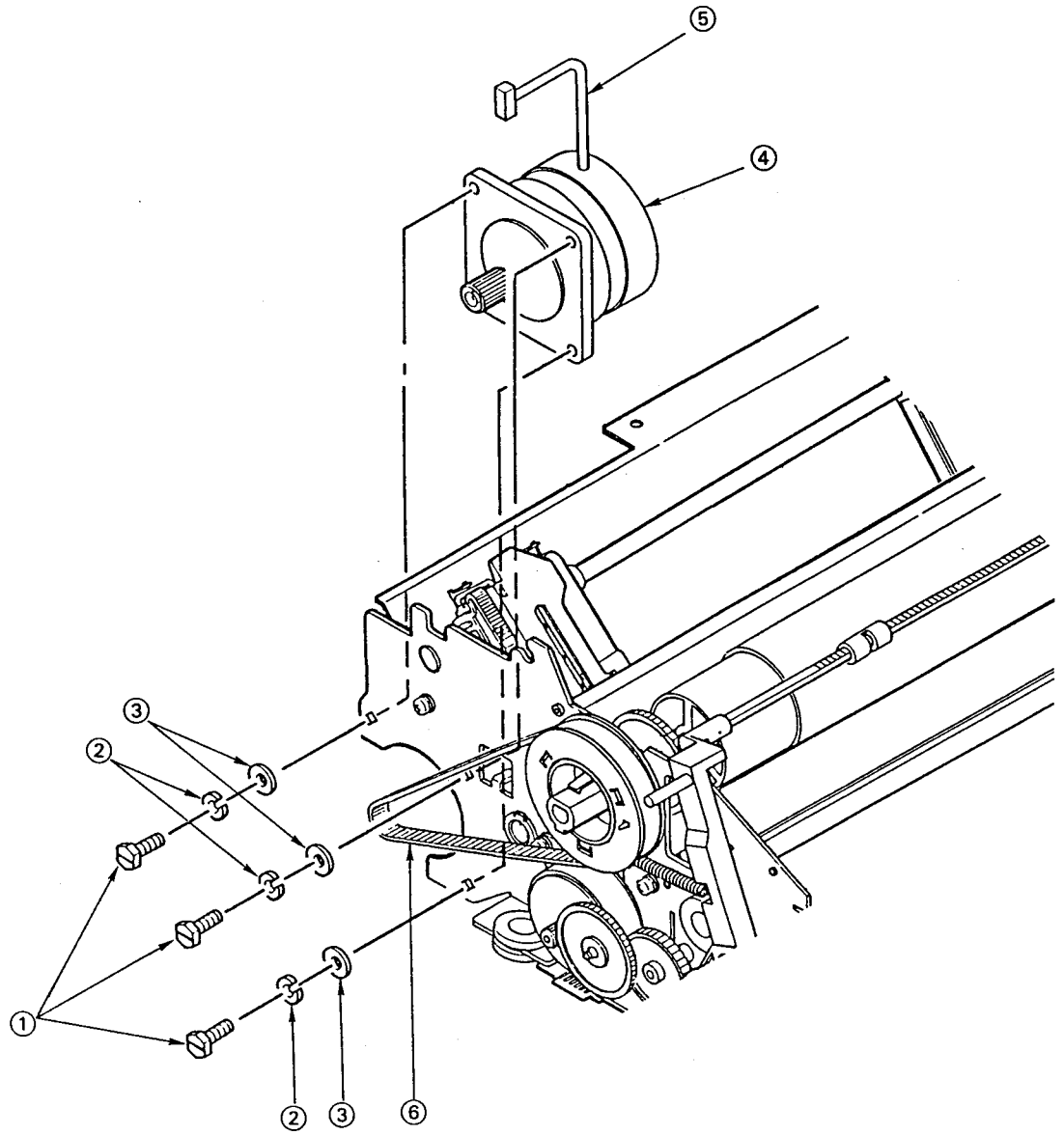
(1) Remove the printer mechanism. (See section 4.3.8.)

(2) Remove three bolts ① , three spring washers ② , and three washers ③ , then remove line feed motor ④ .

(3) To install, reverse the removal procedure sequence.

[Notes on installation]

(1) Pay attention to the orientation of cable ⑤ extending out of line feed motor ④ .
(2) Adjust line feed belt ⑥ tension after installing line feed motor ④ . (See section 5.4.)



4.3.11 Head Cable Assembly

(1) Remove the printhead. (See section 4.3.2.)

(2) Remove the printer mechanism. (See section 4.3.8.)

(3) Remove two screws ①, and remove cartridge bracket ②.

(4) Remove screw ③, and remove connector clamp ④.

(5) Remove head cable connector ⑤ from carriage frame ⑥.

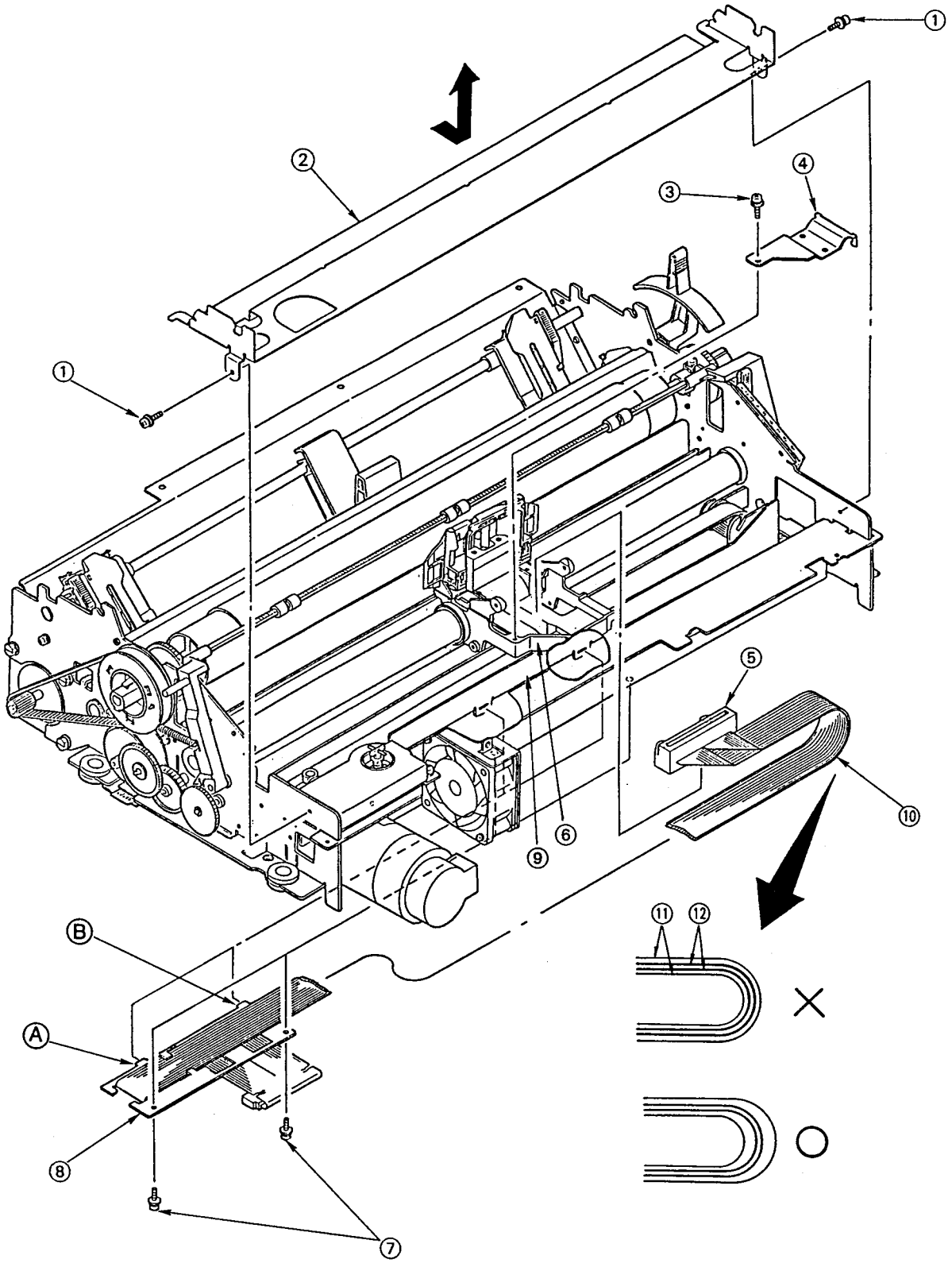
(6) Remove two screws ⑦, and remove the hooks (Ⓐ, Ⓑ) of the cable clamp ⑧ off base frame ⑨.

(7) Remove head cable assembly ⑩ by pulling downward while slightly lifting up the front end of the printer mechanism.

(8) To install, reverse the removal procedure sequence.

[Note on installation]

(1) Be sure to install cable guide ⑪ so that some clearance will be left between head cable ⑫ at the bent portion.


①
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4.3.12 Sensor Board

(1) Remove the printer mechanism. (See section 4.3.8.)

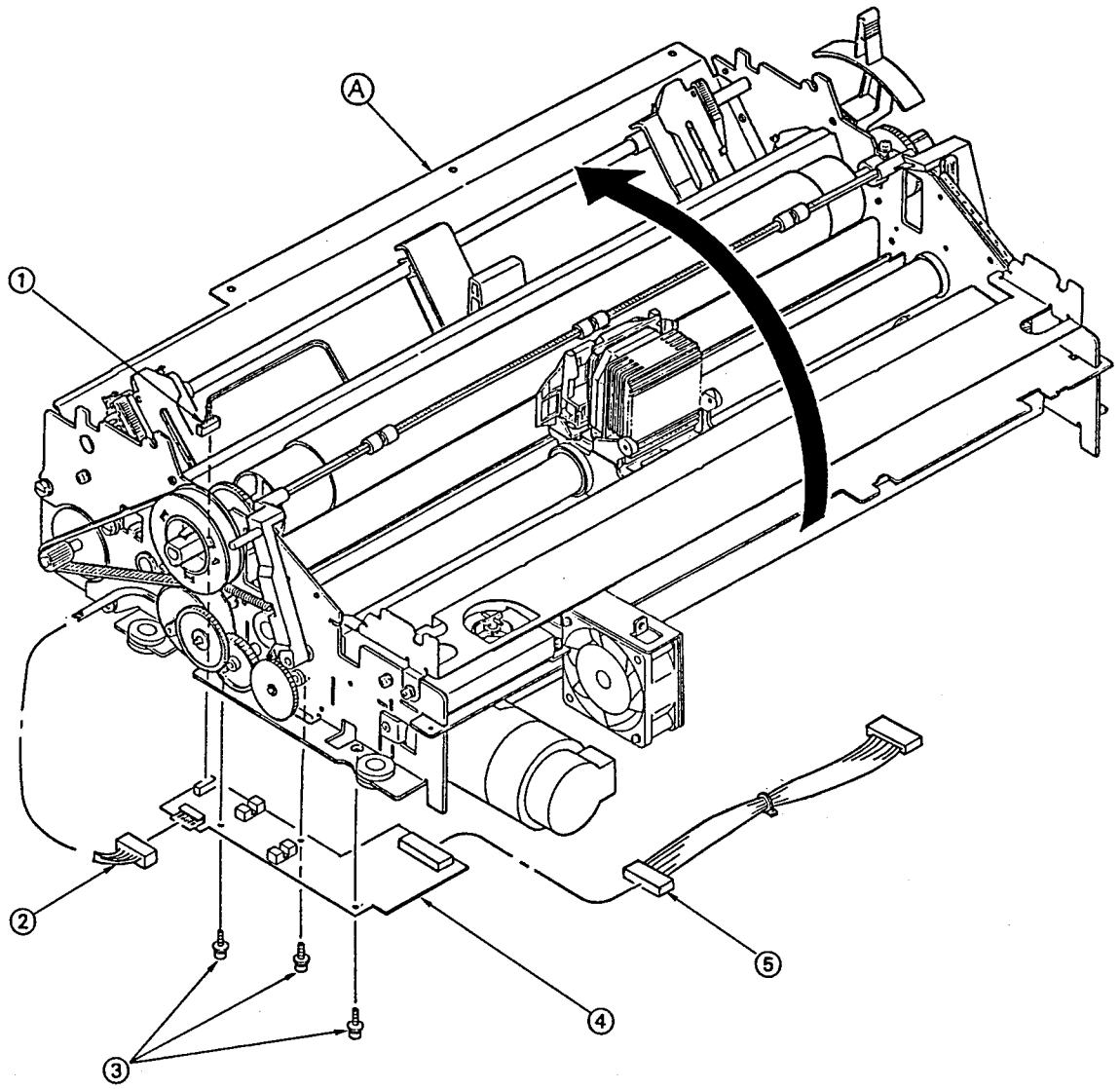
(2) Disconnect cables CN1 ① and CN2 ② connected to sensor board ④.

(3) Raise the printer mechanism by 90° using its portion Ⓐ as a supporting point.

(4) Remove three screws ③, and remove sensor board ④.

(5) Disconnect cables CN3 ⑤ connected to sensor board ④.

(6) To install, reverse the removal procedure sequence.



4.3.13 Ribbon Feed Assembly

(1) Remove the printer mechanism. (See section 4.3.8.)

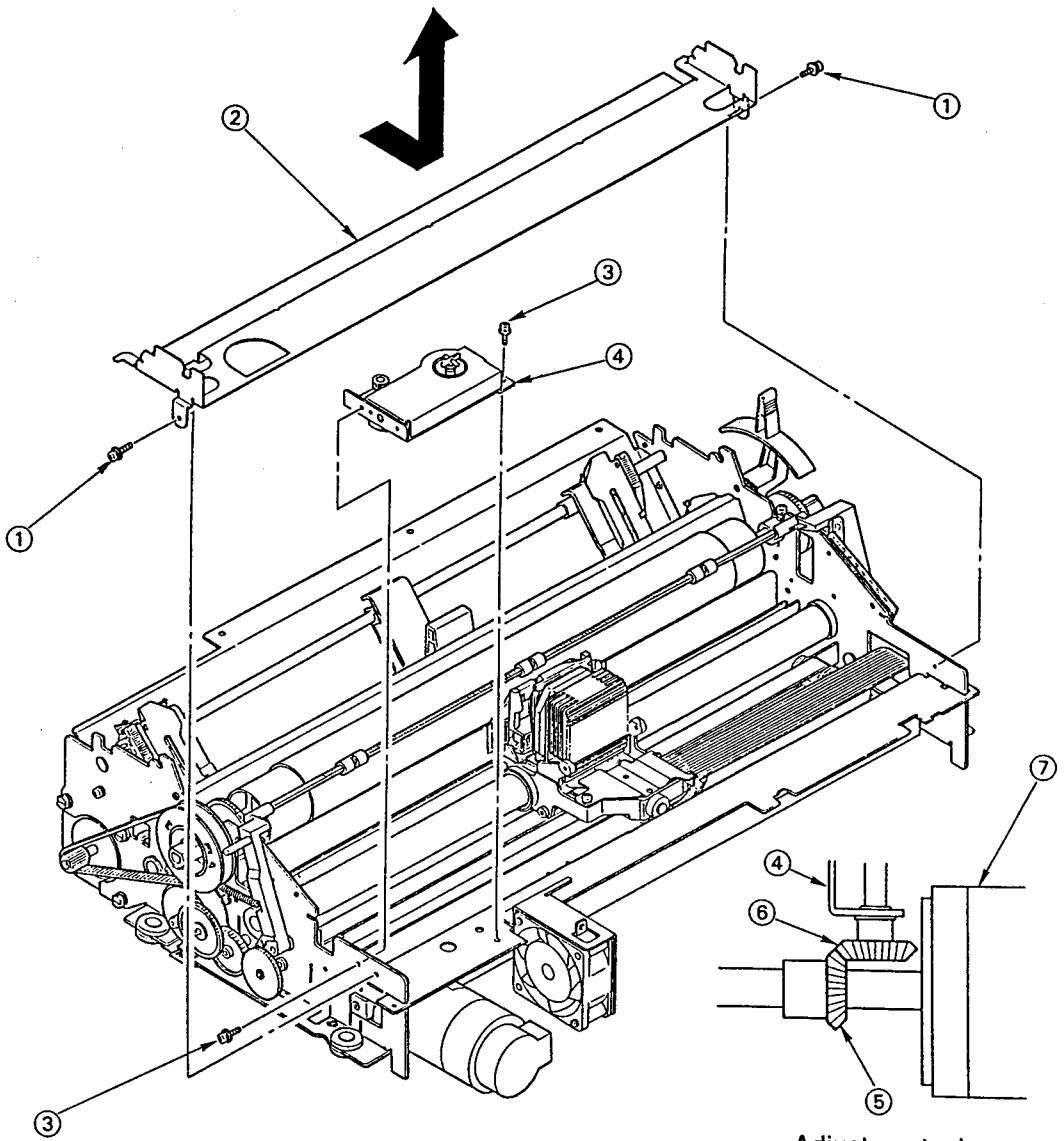
(2) Remove two screws ① , and remove cartridge bracket ② by pulling it to the front.

(3) Remove two screws ③ , and remove ribbon feed assembly ④ .

(4) To install, reverse the removal procedure sequence.

[Note on installation]

(1) Adjust the backlash between bevel gear ⑤ of space motor ⑦ and bevel gear ⑥ of ribbon feed assembly ④ . (See section 5.3.)



Adjustment when assembling

4.3.14 Space Motor Assembly

(1) Remove the ribbon feed assembly. (See section 4.3.13.)

(2) Loosen two screws ① , press belt pulley bracket ② to the left to slacken space belt ⑤ , then tighten screws ① temporarily.

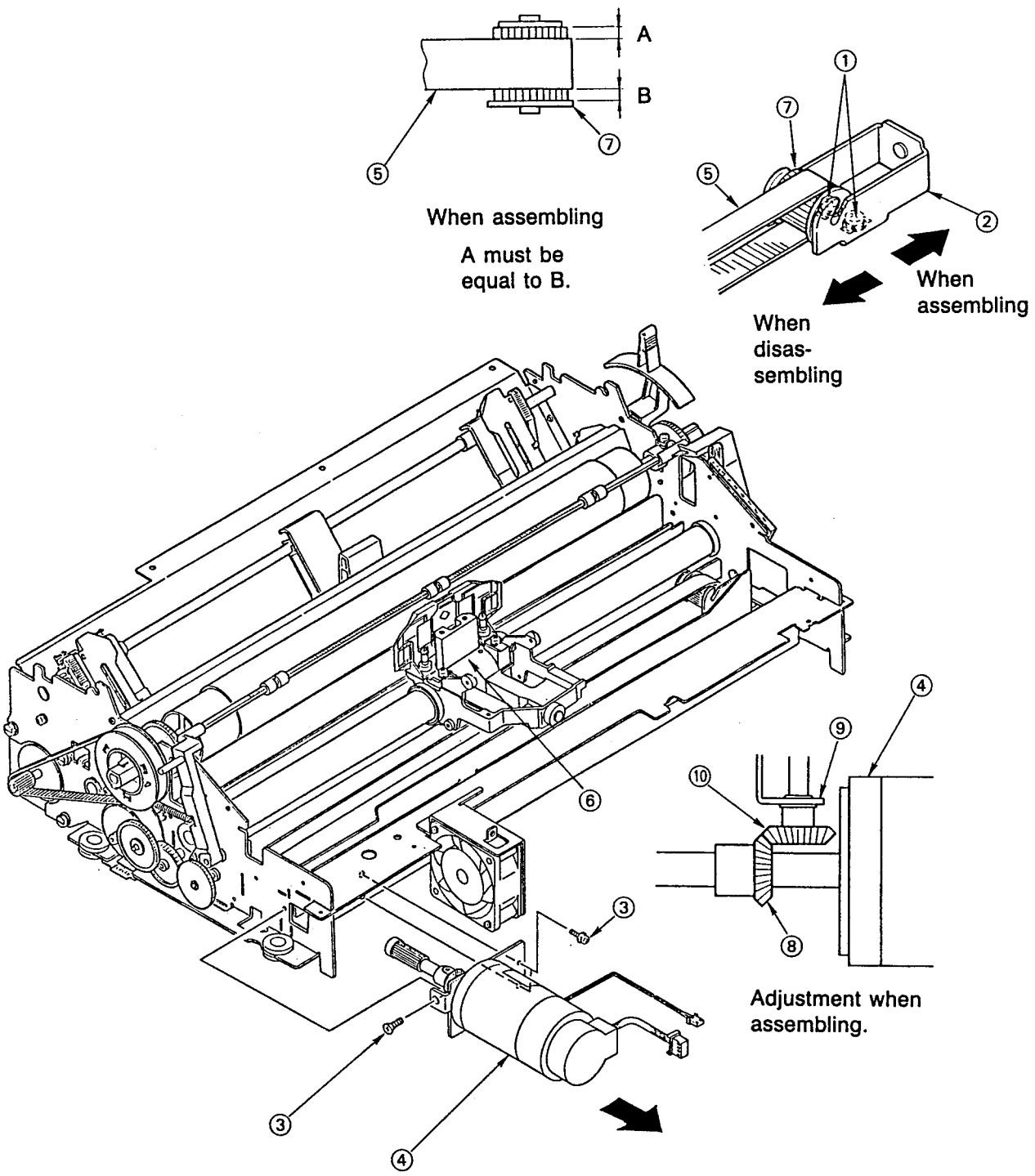
(3) Remove three screws ③ .

(4) Draw out space motor ④ forward. Release cable tie wrap from fan assembly.

(5) To install, reverse the removal procedure sequence.

[Notes on installation]

(1) After installing space motor ④ , loosen screws ① and tense space belt ⑤ , then partially tighten screws ① .
(2) Adjust the position of pulley bracket ② so that space belt ⑤ is positioned at the center of belt pulley ⑦ when carriage frame ⑥ is moved left and right by hand, before tightening the screws.
(3) Adjust the backlash of bevel gears, ⑧ , ⑩ of space motor assembly ④ and ribbon feed assembly ⑨ . (See section 5.3.)


A
B
⑤
⑦
When assembling
A must be equal to B.
①
⑦
⑤
②
When assembling
When disas-sembling
⑥
③
③
④
④
⑨
⑩
⑧
Adjustment when assembling.

4.3.15 Space Belt

(1) Remove the space motor assembly. (See section 4.3.14.)

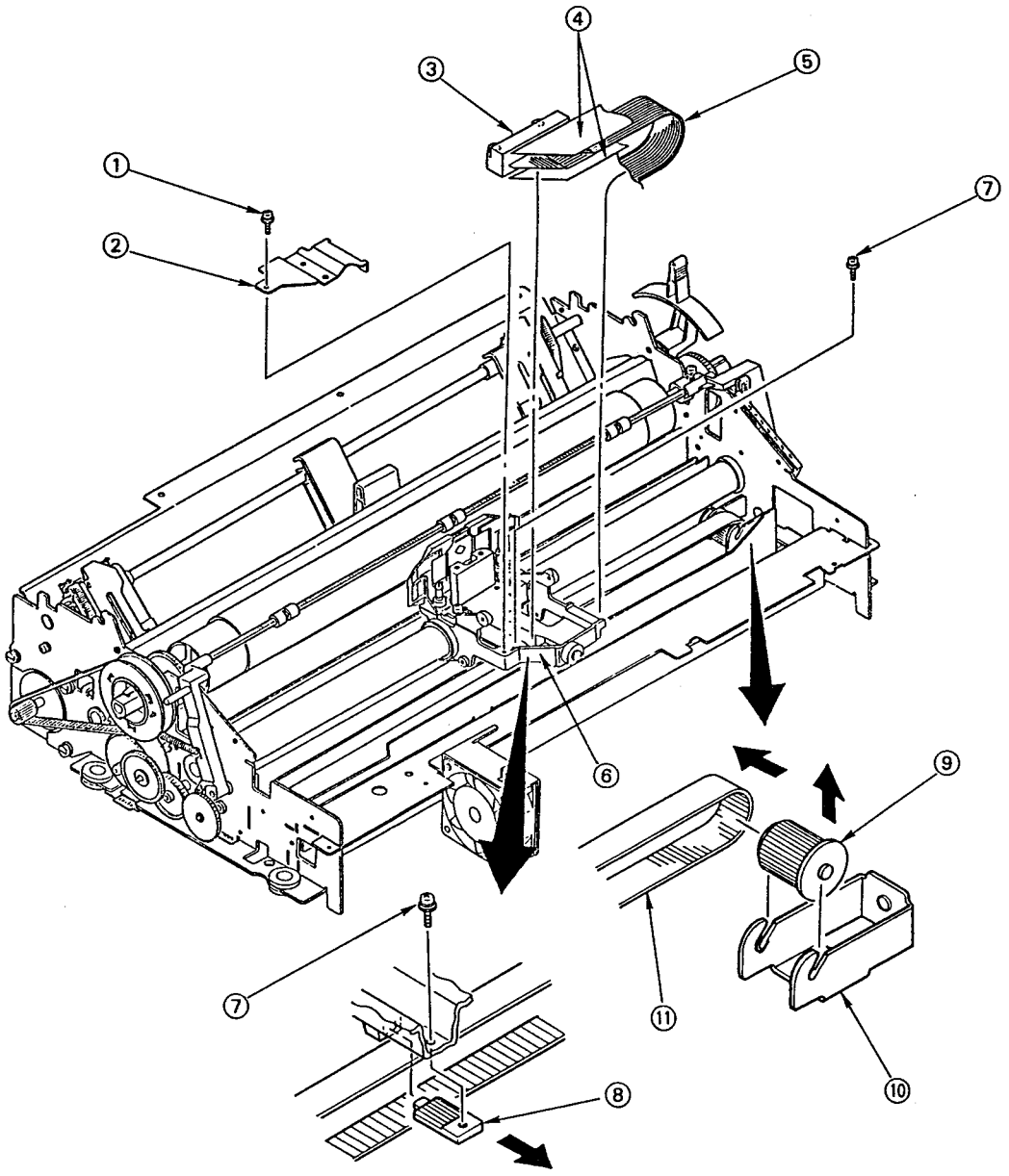
(2) Remove screw ① and connector clamp ② .

(3) Remove connector ③ , cable guide ④ and head cable ⑤ from carriage frame ⑥ .

(4) Remove screw ⑦ and belt clamp ⑧ .

(5) Remove idle pulley ⑨ from idle pulley bracket ⑩ and remove space belt ⑪ .

(6) To install, reverse the removal procedure sequence.



4.3.16 Bail Motor Assembly

(1) Remove the printer mechanism. (See section 4.3.8.)

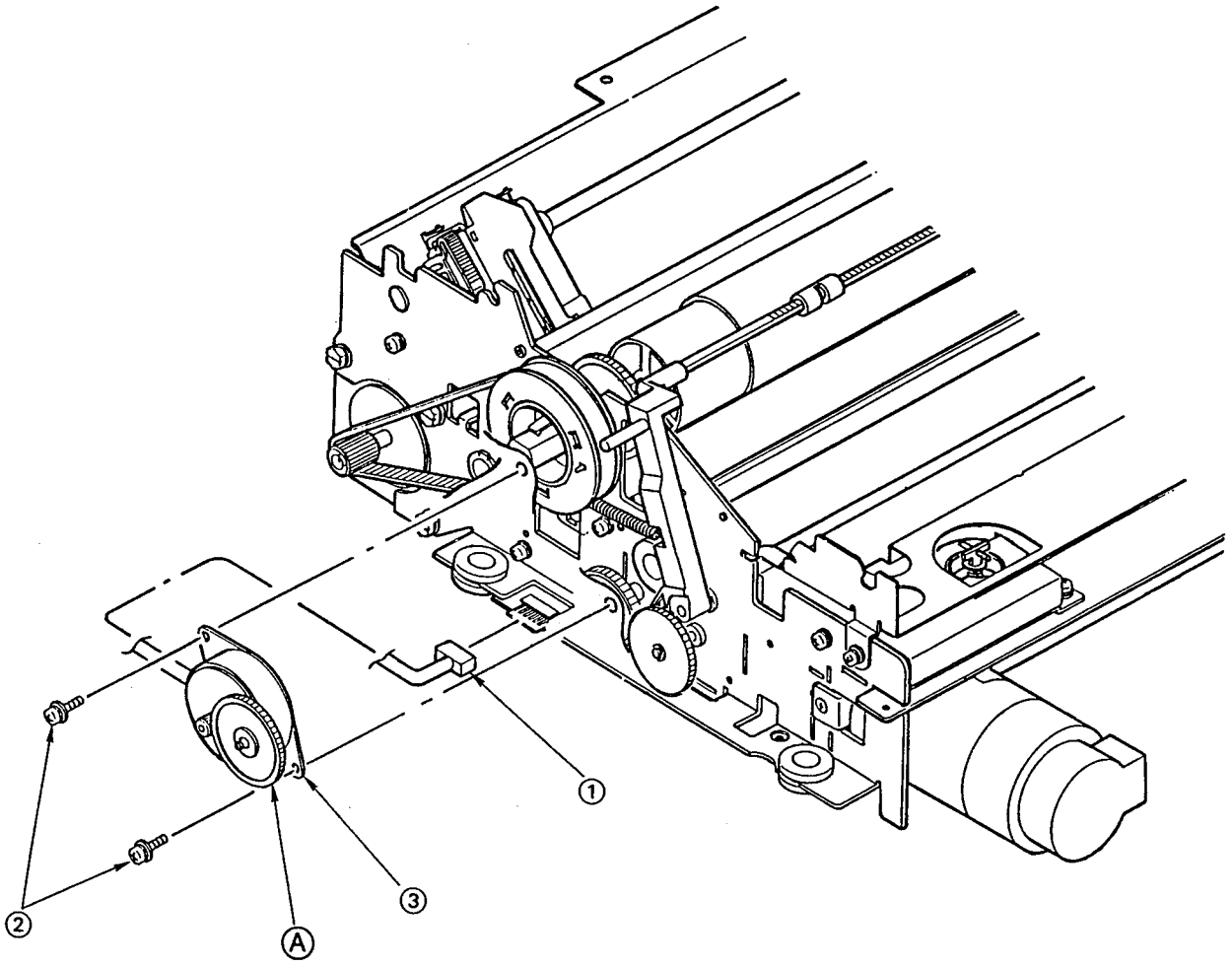
(2) Disconnect cable CN2 ① .

(3) Remove two screws ② , and remove bail motor assembly ③ .

(4) To install, reverse the removal procedure sequence.

[Note on installation]

(1) Adjust the backlash of gear Ⓐ. (See section 5.2.)



4.3.17 Paper Bail Assembly

(1) Remove the bail motor assembly. (See section 4.3.16.)

(2) Remove two springs ① .

(3) Remove idle gear ② .

(4) Remove one "E" snap ring ③ , and remove bail open cam ④ .

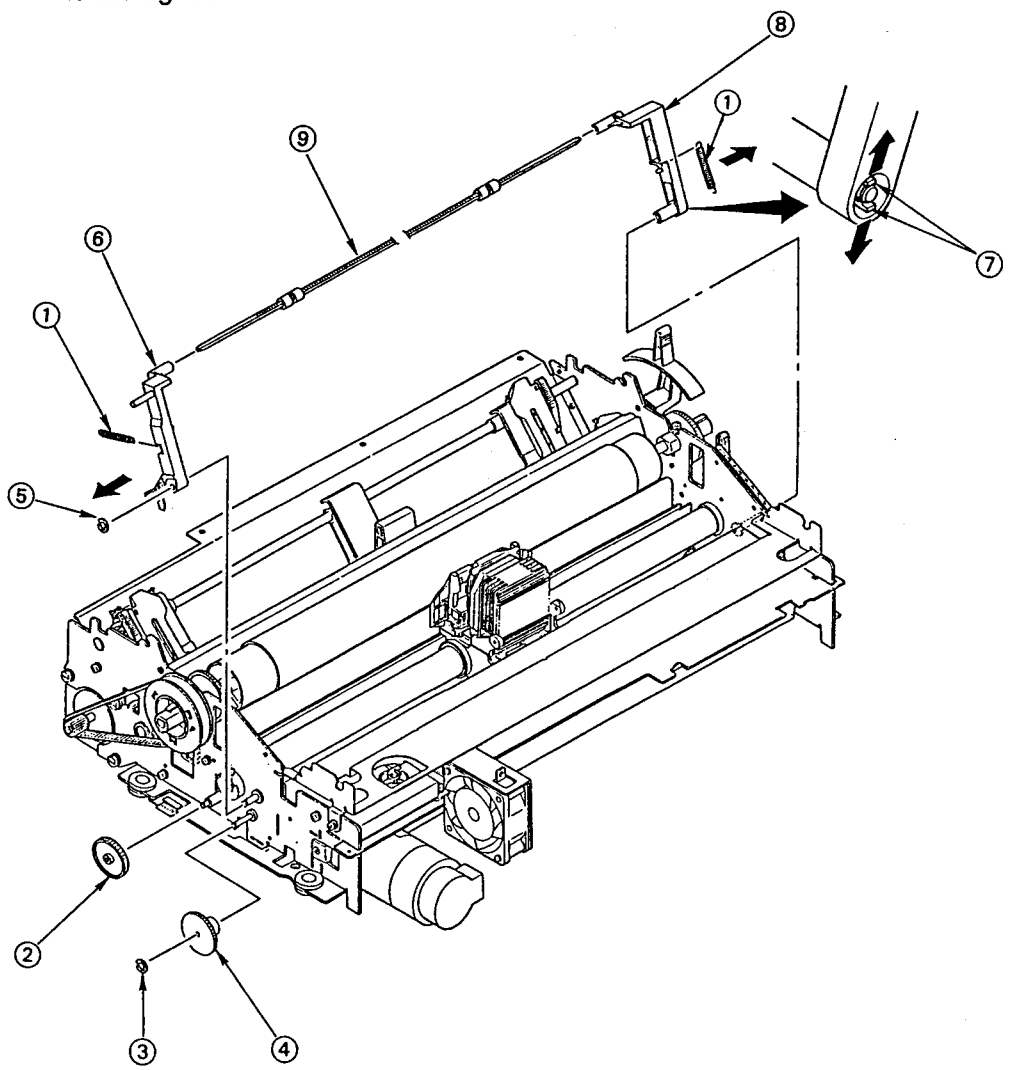
(5) Remove one "E" snap ring ⑤ , and remove bail arm L ⑥ to the left while drawing it from paper bail bar ⑨ .

(6) Remove bail arm R ⑧ to the right while expanding clamp ⑦ outward.

(7) To install, reverse the removal procedure sequence.

[Note on installation]

(1) Since the shape of the spring ① for the right side is different from that for the left side, be careful not to install the spring ① for the right side to the left side and that for the left side to the right side.



4.3.18 Push Tractor Assembly and Release Lever

(1) Remove the bail motor assembly. (See section 4.3.16.)

(2) Remove center guide lower ① .

(3) Remove gear A ② by expanding its clamp Ⓐ in the direction of the arrow, and draw out guide shaft B ③ .

(4) Remove gear B ④ by expanding its clamp Ⓐ in the direction of the arrow, and draw out guide shaft C ⑤ . Center guide upper ⑥ , friction piece ⑦ will come off together.

(5) Disconnect paper end micro switch cable connector ⑨ of push tractor assembly (L) ⑧ and cable clamp ⑩ from base frame ⑪ .

(6) Loosen two screws ⑫ on left and right side, then remove push tractor assembly (L) ⑧ and (R) ⑬ , together with guide shaft A ⑭ .

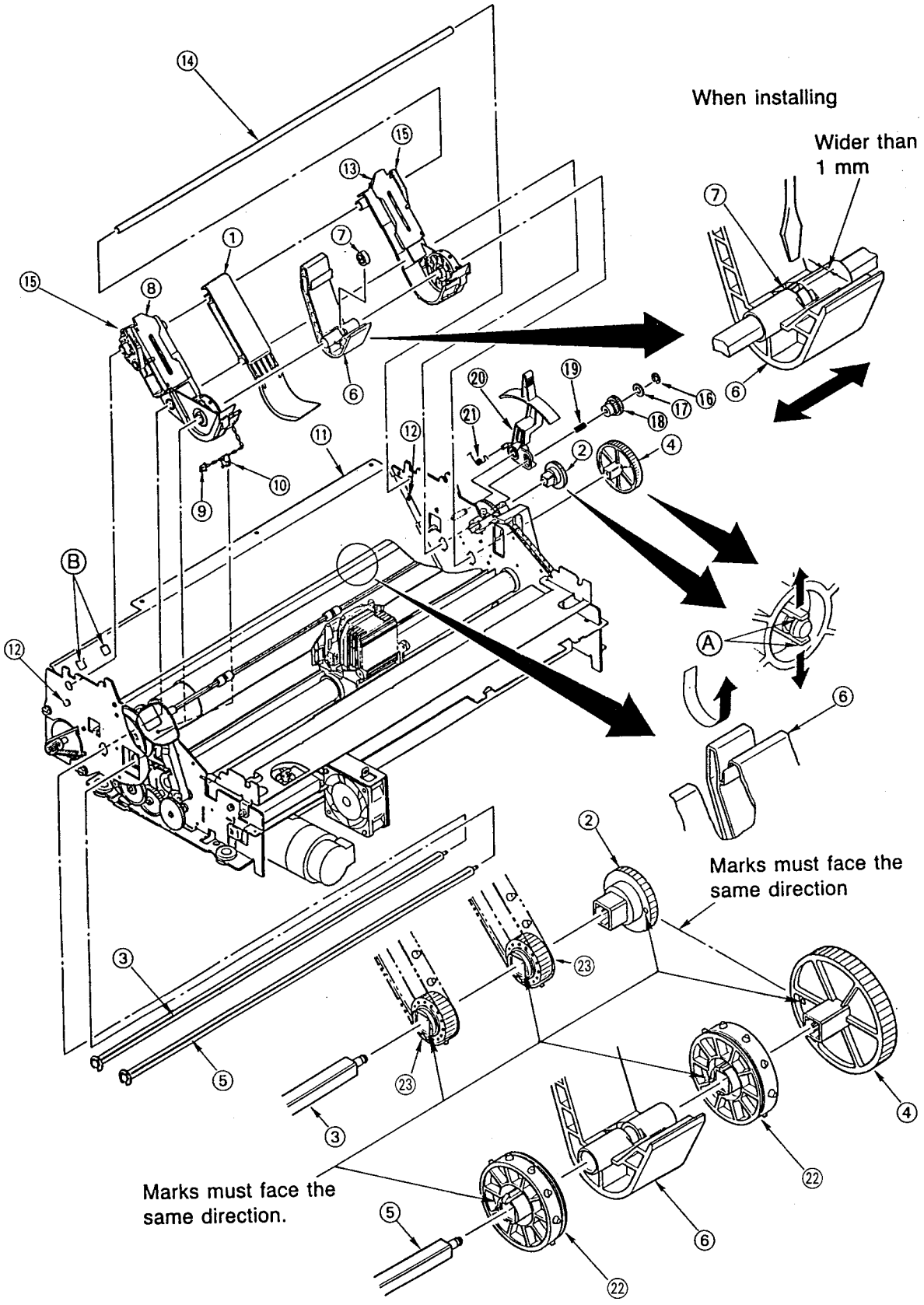
(7) Loosen lock lever ⑮ , then draw out push tractor assembly (L) ⑧ and (R) ⑬ .

(8) Remove E-clip ⑯ , washer ⑰ , idle gear ⑱ and compression spring ⑲ ; then, remove release lever ⑳ . (At this time, spring ㉑ will be removed too, so make sure not to lose it.)

(9) To install, reverse the removal procedure sequence.

[Notes for installation]

(1) Install push tractor assembly (L) ⑧ fitted correctly between two projections Ⓑ.
(2) Install guide shaft B ③ and C ⑤ by the following procedure:
(a) Set the projections of left and right pin tractor wheel ㉒ and a hole of gear B ④ to face the same direction. Then insert guide shaft C ⑤ .
(b) Set the projections of left and right pin tractor wheel ㉓ to face the same direction and insert guide shaft B ③ .
(c) Set the projections of left and right pin tractor wheel ㉓ and a hole of gear A ② to face the same direction, and engage gears A ② and B ④ by setting the holes on them to face each other. Then install gear A ② on guide shaft B ③ .
(3) Install friction piece ⑦ into guide shaft C ⑤ . Then rotate it by 45° with standard screwdriver to give friction. (Try to slide center guide upper ⑥ left and right: If friction is felt, installation is correct; if it slides smoothly, installation is incorrect.)


When installing
Wider than
1 mm
Marks must face the
same direction
Marks must face the
same direction.

4.3.19 Cooling Fan

(1) Remove the printer mechanism. (See section 4.3.8.)

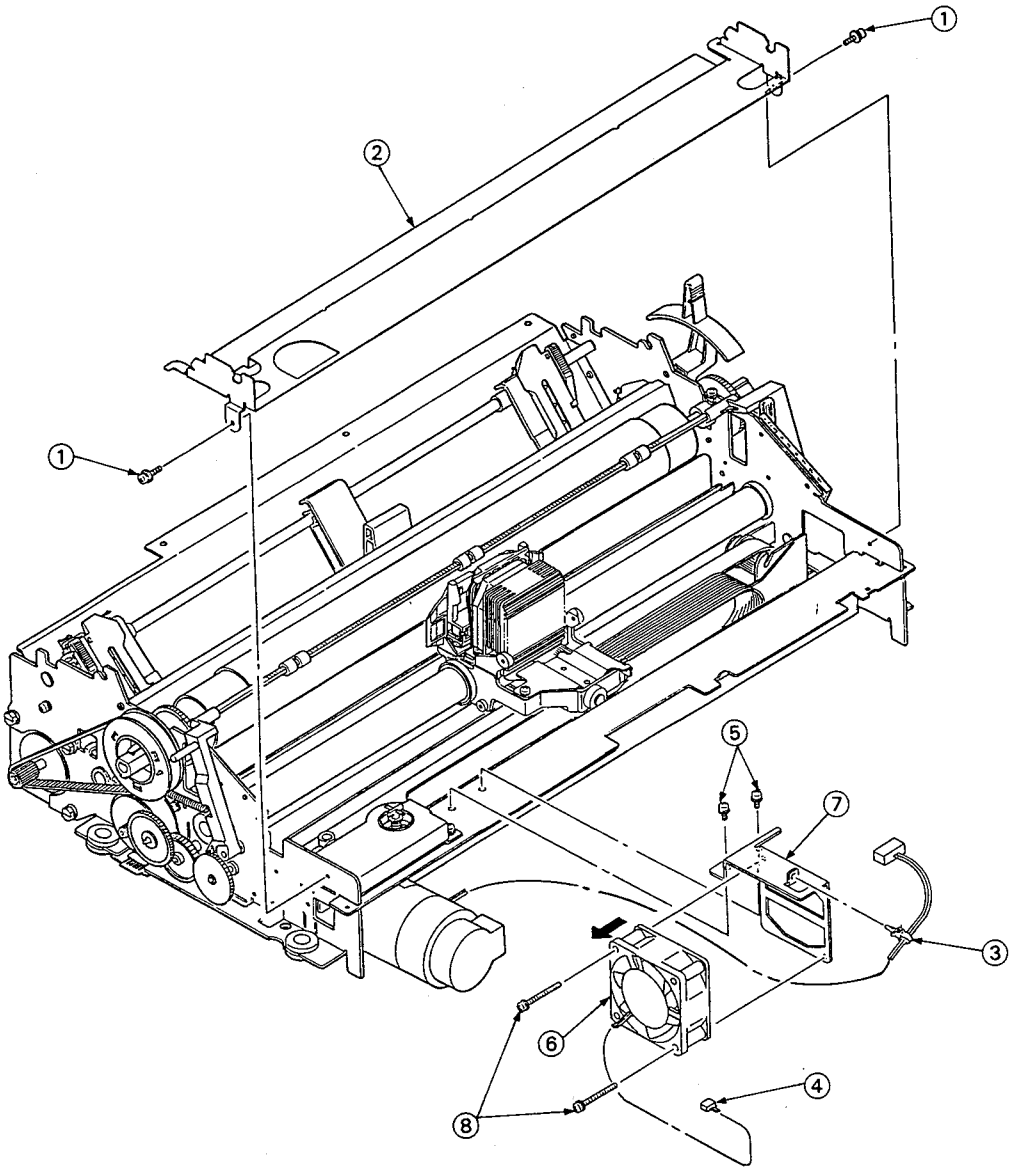
(2) Remove two screws ① , then remove ribbon cartridge bracket ② .

(3) Remove cable clamp ③ and connector cable ④ .

(4) Remove two screws ⑤ , then remove cooling fan ⑥ together with fan cover ⑦ .

(5) Remove two screws ⑧ , and then remove the cooling fan ⑥ in the arrow direction.

(6) To install, reverse the removal procedure sequence.



4.3.20 Power Supply Unit

(1) Remove the printer mechanism. (See section 4.3.8.)

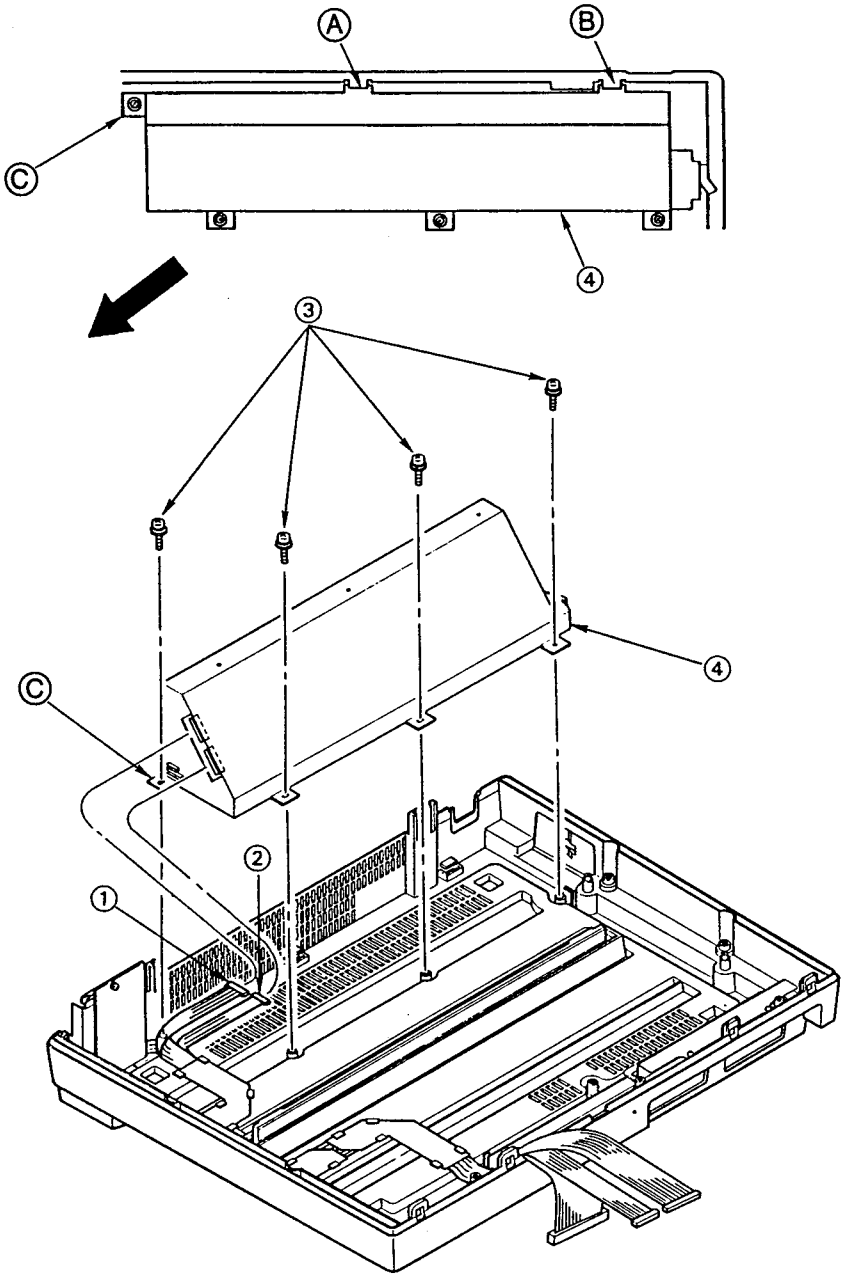
(2) Disconnect two cables ① and ② from the left side face of power supply unit ④.

(3) Remove four screws ③.

(4) Draw out power supply unit ④ toward the left front while raising it a little so that it will come off guides Ⓐ and Ⓑ of the lower cover.

Do not damage cables ①, ② with portion Ⓒ of power supply unit ④.

(5) To install, reverse the removal procedure sequence.



5. ADJUSTMENT

5. ADJUSTMENT

(1) Be sure to carry out this adjustment with the printer mechanism mounted on the lower cover.

(2) Be sure to carry out this adjustment operation on a level and highly rigid work table (flatness: less than 0.039 inch or 1 mm) so as to minimize adjustment error.

5.1 Gap Between Platen and Printhead

(1) Adjusting position

Perform adjustment at the three positions of left, center and right ends of the platen.

(2) Adjustment value

a = 0.014 ± 0.002 inch (0.35 ± 0.05 mm)

(3) Preparation for adjustment

(a) Set the adjusting lever to range 1.

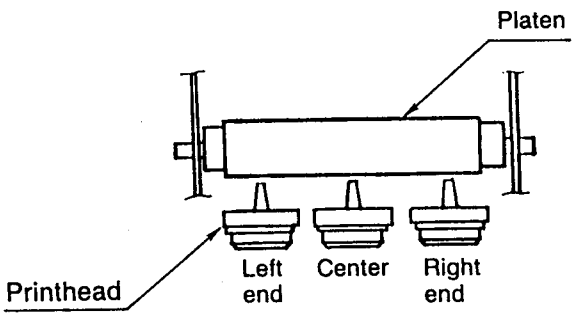
(b) Set the release lever to "open".

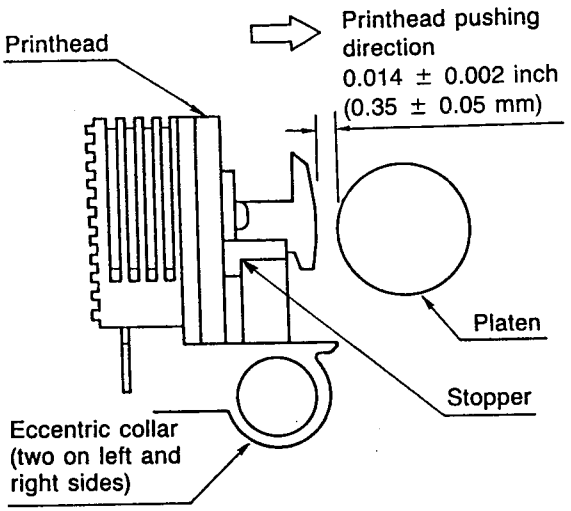
(c) Remove the ribbon protector before adjustment.

(4) Adjusting procedure

To adjust the gap, loosen the left and right eccentric collar setscrews, and rotate the collar until the correct gap is obtained.

Note: *1. Make sure that the printhead is fitted correctly to the stopper.*





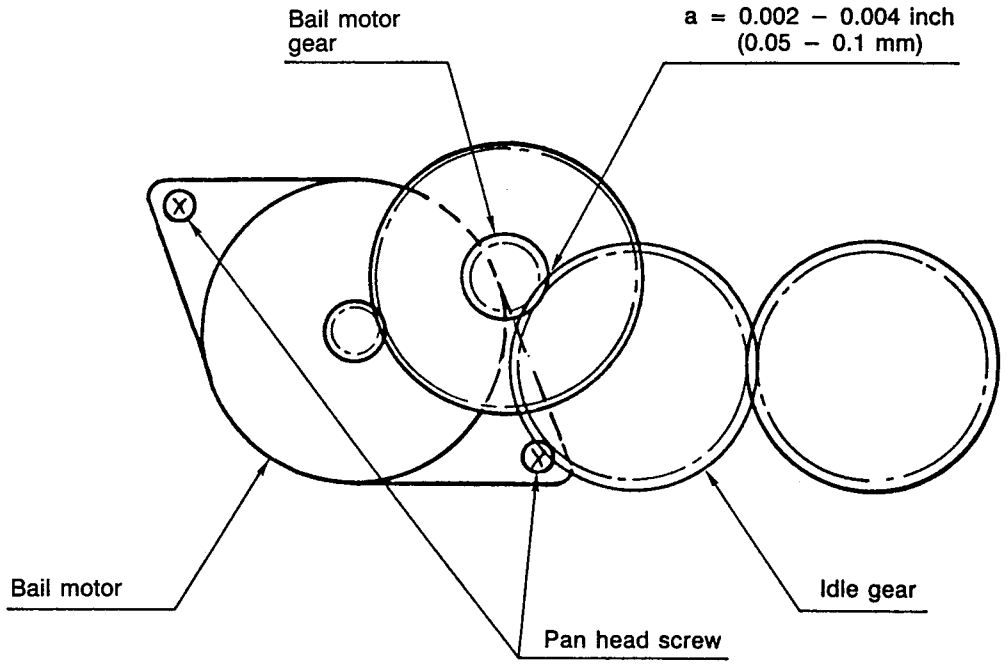
5.2 Bail Motor Gear Backlash

(1) Adjustment value

a = 0.002 to 0.004 inch (0.05 to 0.1 mm)

(2) Adjusting procedure

Loosen the two pan head screws securing the bail motor, and adjust the backlash between the bail motor gear and idle gear.



5.3 Ribbon Drive Bevel Gear Backlash

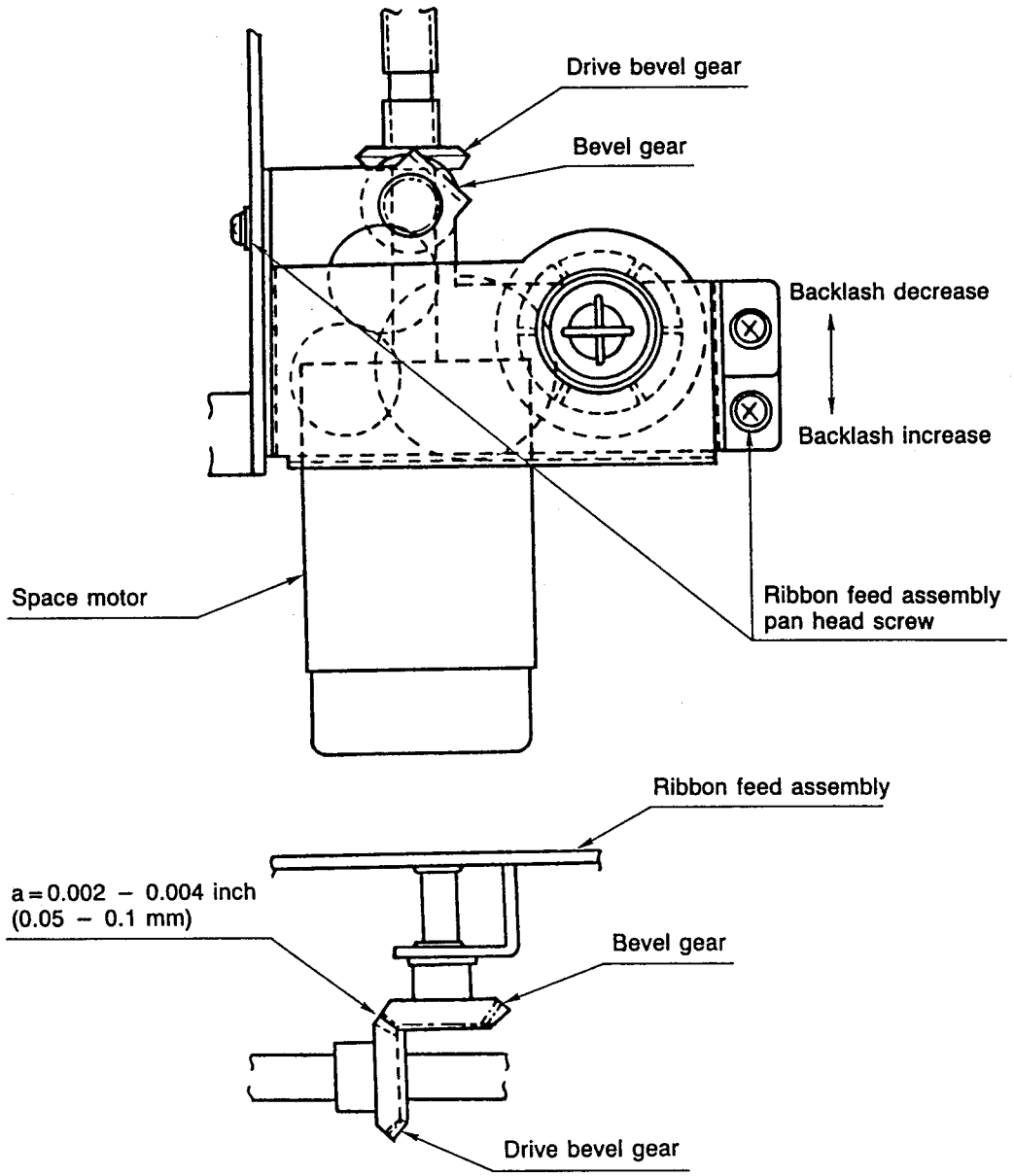
(1) Adjustment value

a = 0.002 to 0.004 inch (0.05 to 0.1 mm)

(2) Adjusting procedure

Loosen the two pan head screws securing the ribbon feed assembly, and move the ribbon feed assembly back and forth to adjust the gear backlash.

If moved forth, the backlash decreases.
If moved backward, the backlash increases.



5.4 Line Feed Belt Tension

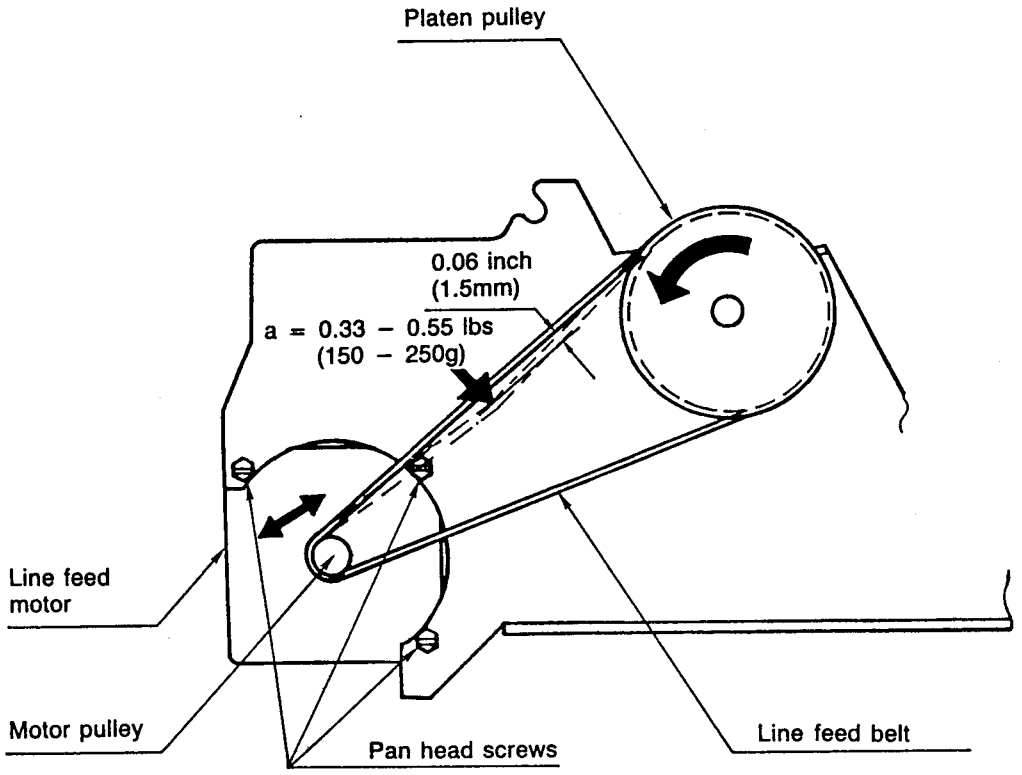
(1) Adjustment value

a = 0.33 to 0.55 lbs (150 to 250 g)

(2) Adjusting procedure

Adjust the line feed motor position so that the specified belt tension is obtained when the belt is depressed 0.06 inch (1.5 mm) in the middle of the span between the platen pulley and motor pulley.

Note: *Revolve the platen pulley at least once before adjustment.*



6. CLEANING AND LUBRICATION

6.1 CLEANING

[Cautions]

1. Be sure to turn OFF the AC POWER switch before cleaning.
2. Do not allow dust to get inside the mechanism unit when cleaning.
3. If a lubricated part has been cleaned, be sure to apply lubricating oil to that portion after cleaning.

(1) Cleaning time

When the equipment operating time has reached six months or 300 hours, whichever comes first.

(2) Cleaning tools

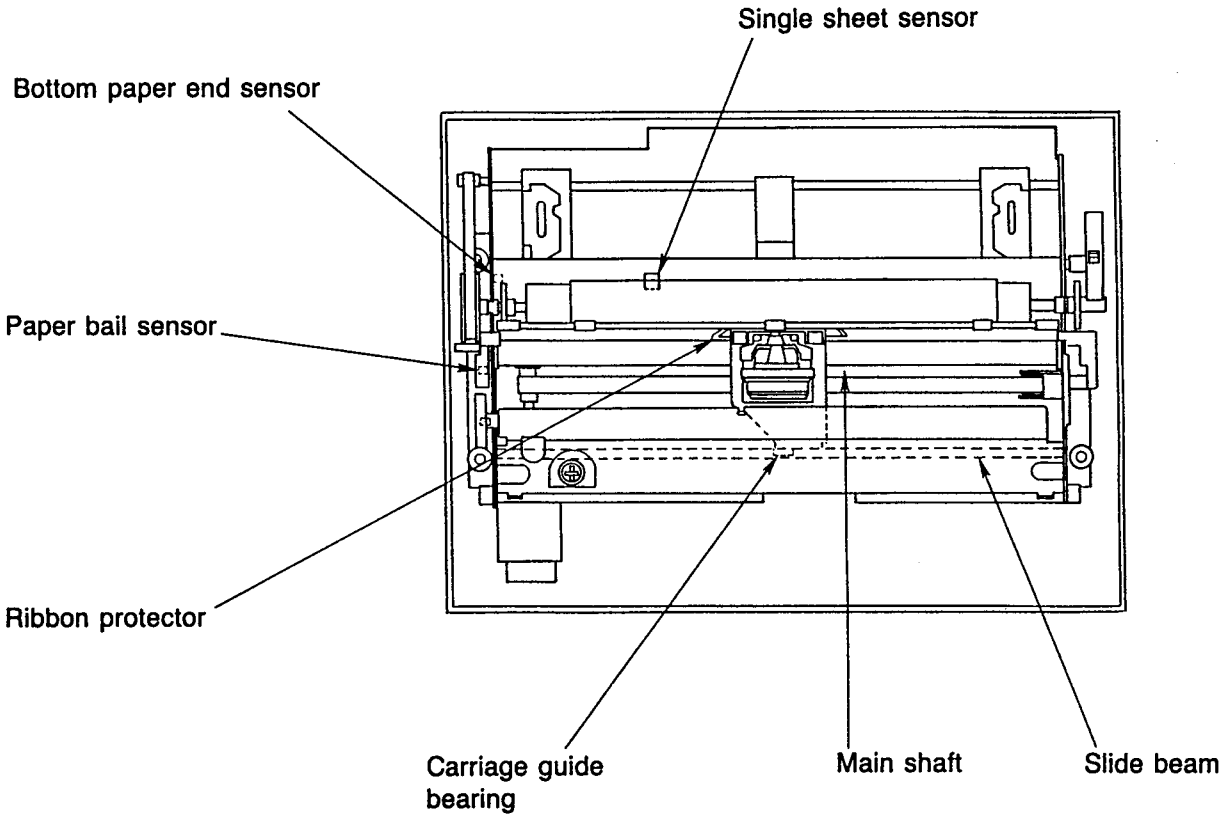
Dry cloth (soft cloth such as gauze), brush, cotton swab, vacuum cleaner

(3) Places to be cleaned

Table 6.1 lists the places to be cleaned:

Table 6.1

Place to be cleaned	Cleaning procedure
Main shaft and surrounding portion Top surface of slide beam Form runner portion Ribbon protector and surrounding portion	Remove paper dust, and wipe off dirt, dust, and ribbon dust.
Single sheet sensor Paper bail sensor Bottom paper end sensor	Wipe off dirt from sensor. Wipe off dirt in the sensor window with a brush.
Carriage guide bearing	Wipe off dirt and dust.


Single sheet sensor
Bottom paper end sensor
Paper bail sensor
Ribbon protector
Carriage guide bearing
Main shaft
Slide beam

6.2 LUBRICATION

(1) Cleaning time

When the operating hours have reached one year or 600 hours.

(2) Lubricant

- Pan motor oil 10W-30 (or equivalent): PM
- Alvania grease #2EP (or equivalent) : GEP

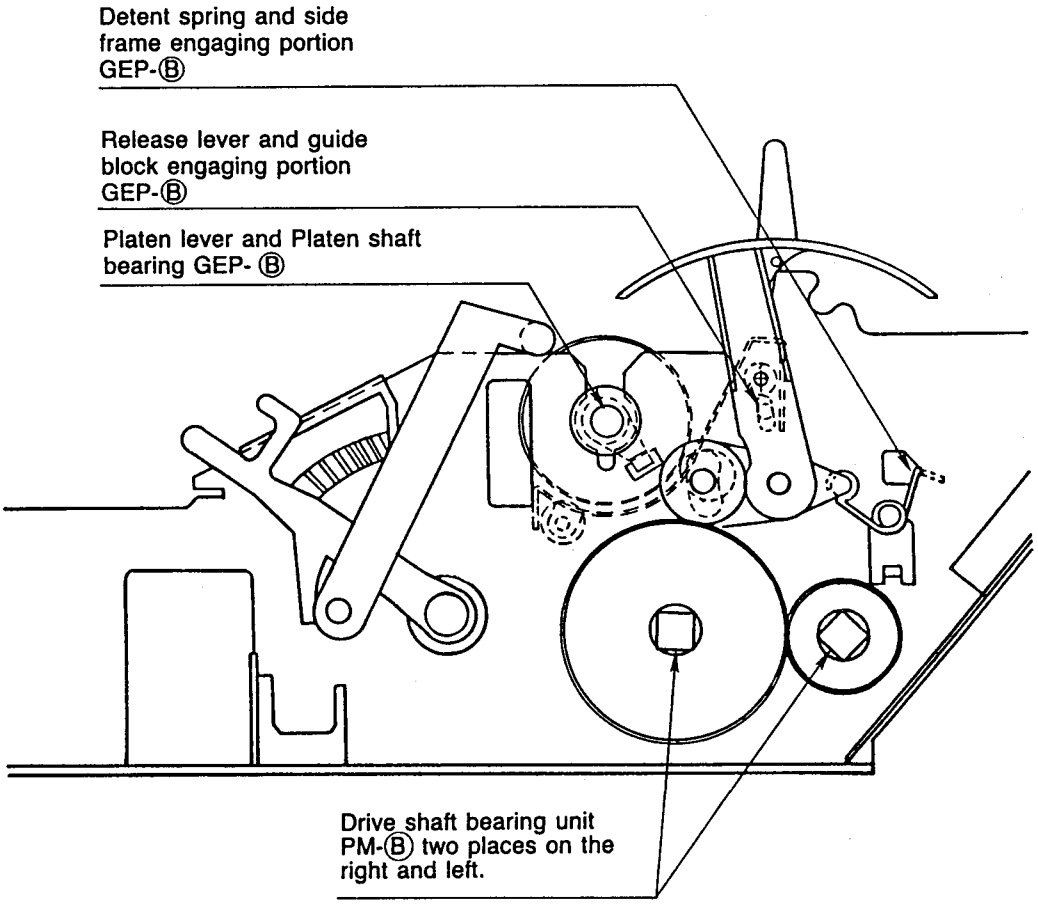
(3) Amount of lubricant

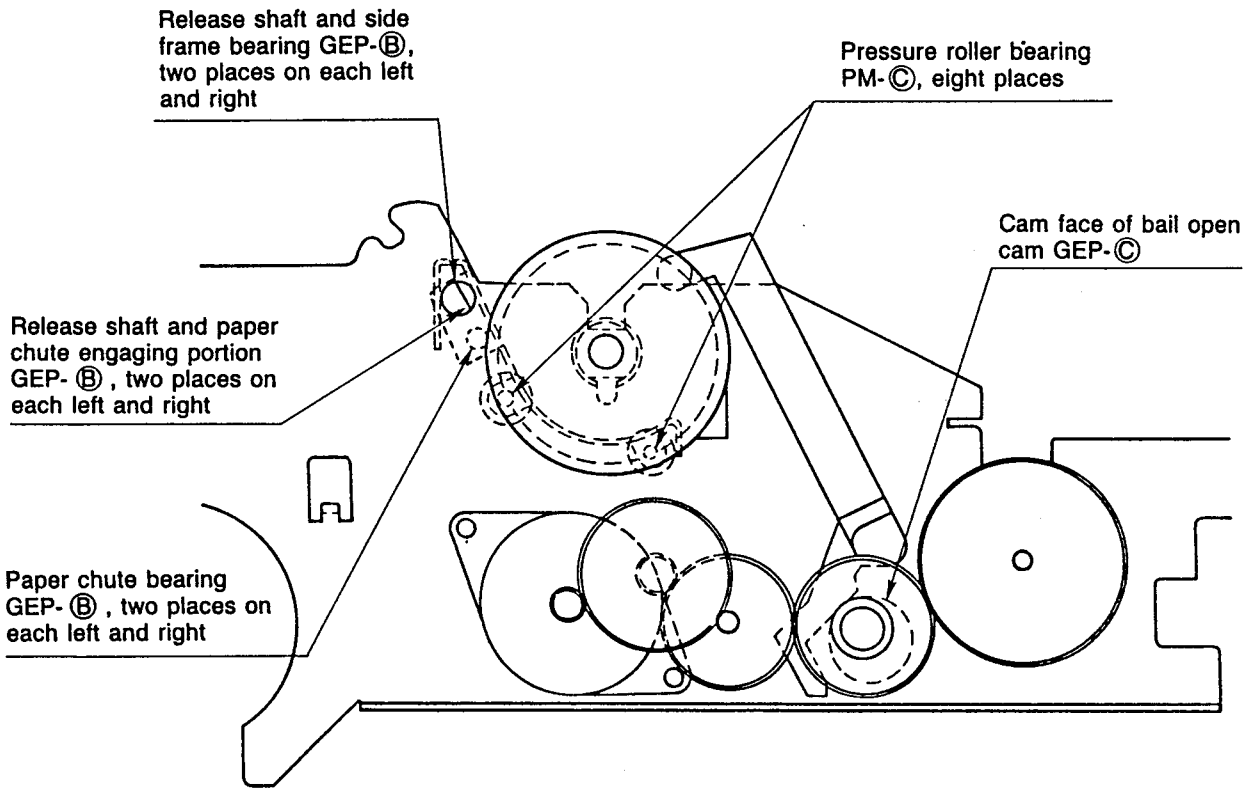
- Large amount A : Apply abundantly.
- Medium amount B : Apply three to four drops of oil, or 0.008 inch (0.2 mm) thick grease.
- Small amount C : Apply one drop of oil.

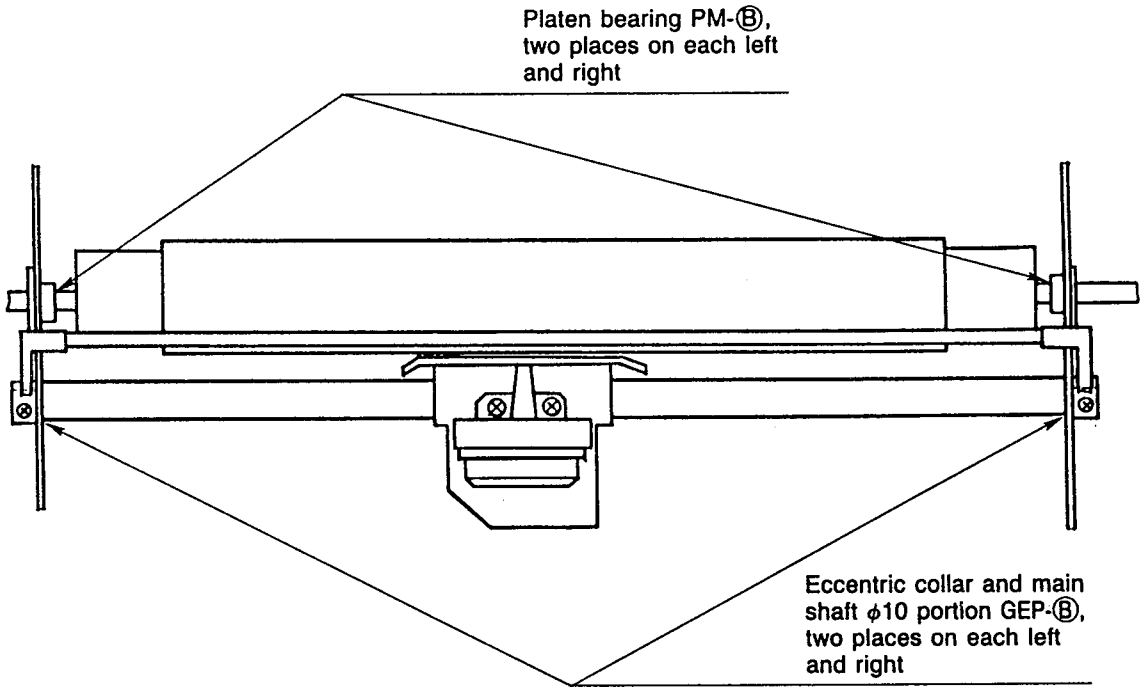
(4) Areas to avoid

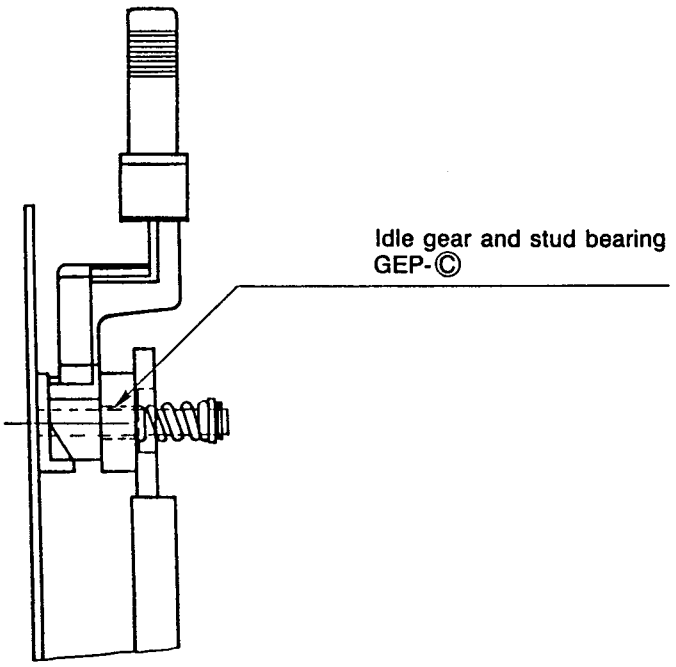
No.	Do not lubricate	Reason	Remarks
1	Ink ribbon	To prevent blurring of print image	
2	Sensors	To prevent dust attachment	
3	Platen assembly (rubber face)	To prevent stained paper	
4	Sheet feeder assembly	To prevent stained paper	
5	Mini-pitch belt	To prevent deterioration and elongation of rubber	
6	Mini-pitch belt pulley tooth face	To prevent deterioration and elongation of rubber	
7	Head cable assembly	To prevent cable break	
8	Printhead	To prevent malfunction of print head	

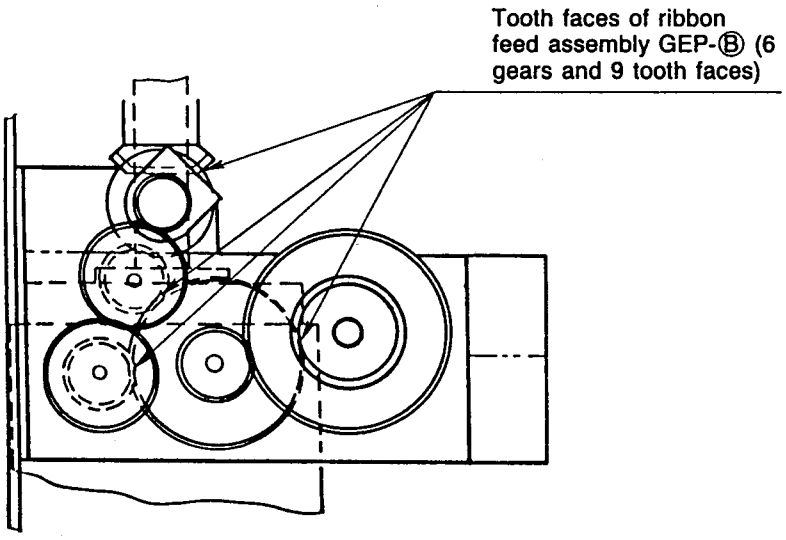
(5) Lubrication points

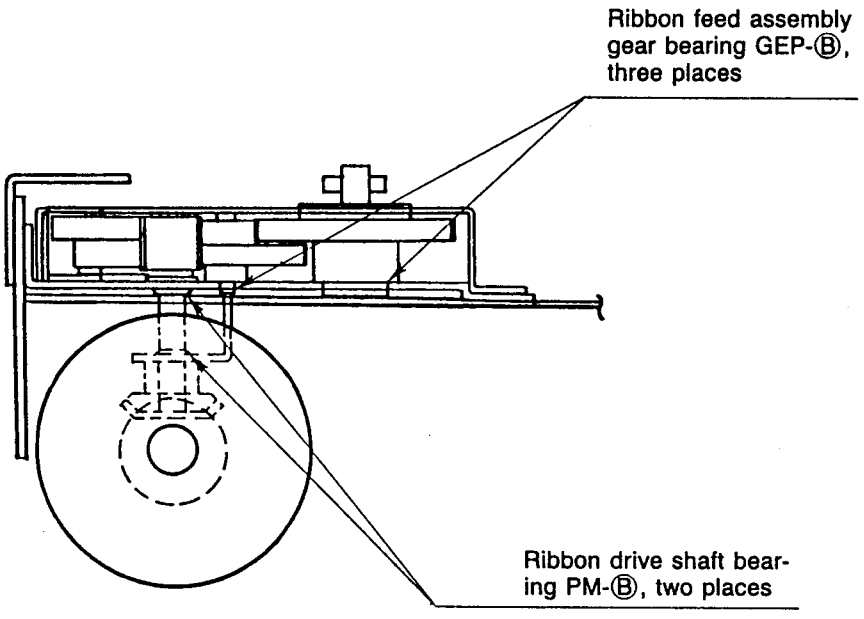

Detent spring and side frame engaging portion GEP-Ⓑ
Release lever and guide block engaging portion GEP-Ⓑ
Platen lever and Platen shaft bearing GEP- Ⓑ
Drive shaft bearing unit PM-Ⓑ two places on the right and left.


Release shaft and side frame bearing GEP-Ⓑ, two places on each left and right
Pressure roller bearing PM-Ⓒ, eight places
Cam face of bail open cam GEP-Ⓒ
Release shaft and paper chute engaging portion GEP- Ⓑ , two places on each left and right
Paper chute bearing GEP- Ⓑ , two places on each left and right

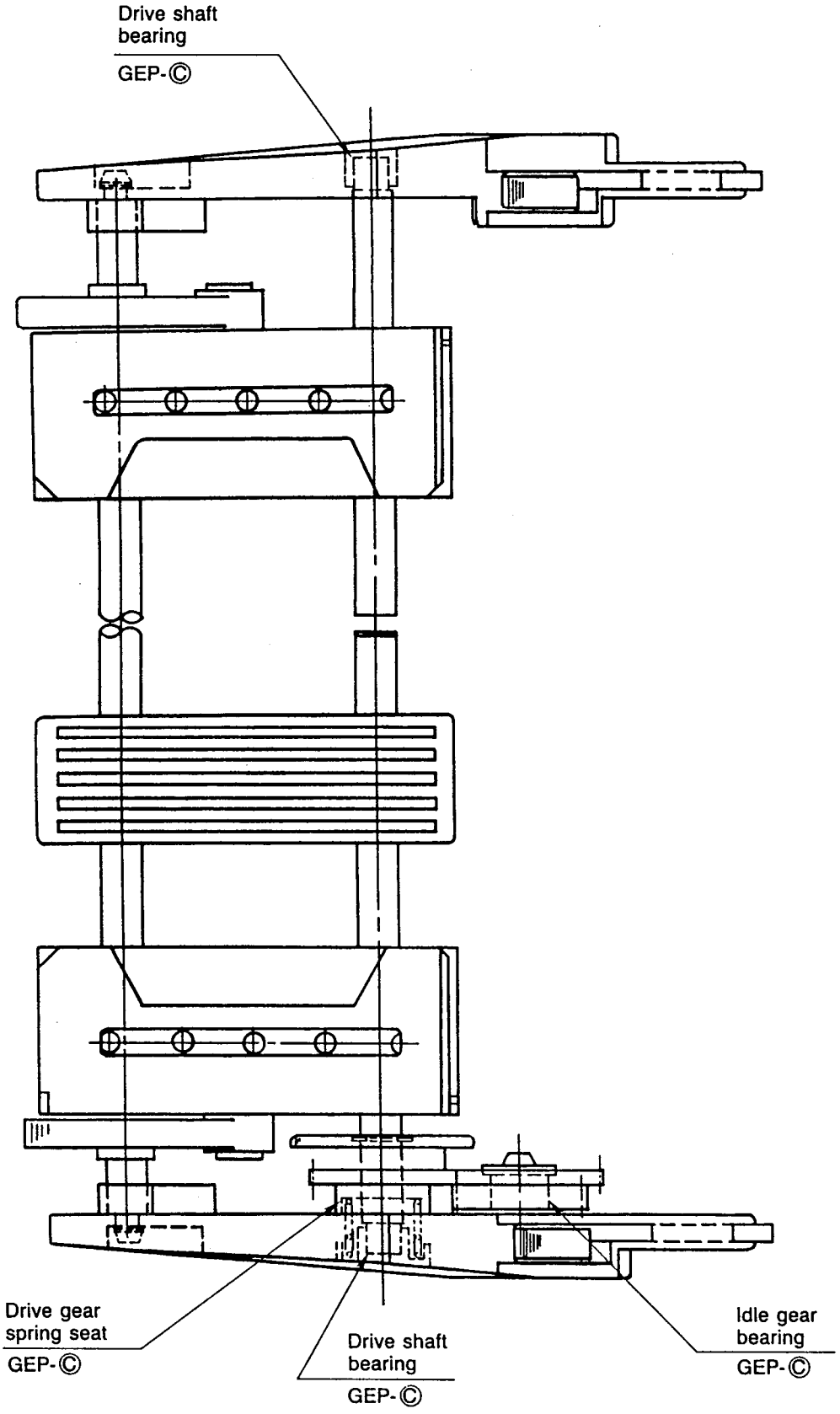

Platen bearing PM-Ⓑ,
two places on each left
and right
Eccentric collar and main
shaft ϕ10 portion GEP-Ⓑ,
two places on each left
and right


Idle gear and stud bearing
GEP-Ⓒ


Tooth faces of ribbon feed assembly GEP-Ⓑ (6 gears and 9 tooth faces)


Ribbon feed assembly gear bearing GEP-Ⓑ, three places
Ribbon drive shaft bearing PM-Ⓑ, two places

(6) Lubrication points of pull tractor unit (option)



7. TROUBLESHOOTING AND REPAIR

7. TROUBLESHOOTING AND REPAIR

7.1 Items to Check Before Repair

(1) Check the inspection items specified in the instruction manual.

(2) Find out as many details of the trouble as possible from the customer.

(3) Inspect in the conditions as close as possible to those at the time the trouble occurred.

(4) Proceed with the repair as follows:

Check the trouble status according to Table 7.1 for the details of the trouble. Then, locate the trouble position according to the detailed flowchart.

(5) Carry out a thorough test after the repair to check for correct functioning.

7.2 Troubleshooting Table

Table 7.1

Status	Details	Flowchart item No.
Trouble upon power on	• Power is not supplied. • No spacing operation. (Alarm lamp blinking) • Homing does not end normally.	① ② ③
Trouble during printing	• Wrong character, character omission or dot omission • Ribbon feed trouble • Line feed trouble • Malfunction of switch on operation panel • Data receiving failure	④ ⑤ ⑥ ⑦ ⑧

7.3 Lamp Display

(1) Printer mode display

Table 7.2

Printer mode		ALARM	SELECT	Contents	Remarks
Operation mode	ON LINE	OFF	ON	Indicates that the printer is ready for receiving.	
	HEX DUMP			Indicates that the printer is in the hex dump mode.	
	LOCAL	OFF	OFF	Indicates that the printer is in the local mode.	
	MENU			Indicates that the printer is in the menu mode.	
Operator alarm	Paper end	ON	OFF	Form end, single sheet end, or bottom paper end	
	Paper jam			SASF paper jam or double paper setting	
	CSF paper jam			Paper jam or paper end when CSF is installed	
	Cover open	ON	OFF	Indicates that the cover is open.	
	Print suppress	OFF	BLINK	Indicates that the printer is in the print suppress mode.	
	Printhead thermal alarm	OFF	ON	For details see Table 7.4.	
Fault alarm		BLINK	ON	For details see paragraph (2) fault alarm display.	

(2) Fault alarm display

When the printer detects any of the various alarm states, the information is displayed as shown below on the operation panel. The alarm is specified by lamp combination of PRINT QUALITY and CHARACTER PITCH. (See Table 7.3 for details.)

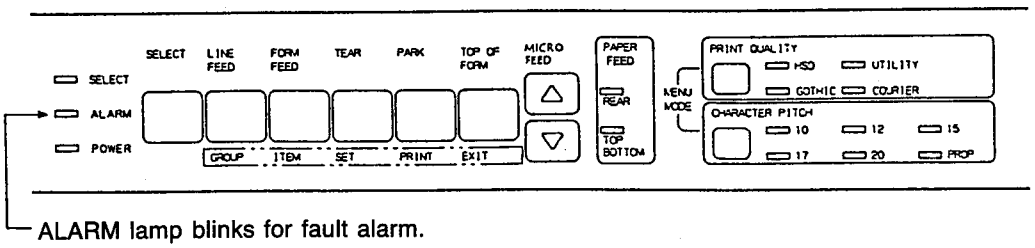


Figure 7-1

Table 7.3

Error Category	PQ lamp	CPI lamp	Comments	Remedies
F/W ALARM	non	10	Message Alarm (Program internal error)	• Turn the power off and then on again.
		12	Over run Alarm (Program internal error)	• Replace the program ROM.
CPU ALARM	HSD	10	Internal RAM error	
		12	NMI Alarm (Non maskable interrupt detected)	• Replace the control board.
		15	Watch Dog Timer Alarm (Program is out of control.)	
		17	Break Alarm (Program runs in illegal address.)	
ROM/RAM ALARM	UTILITY	10	Program ROM error	
		12	EEPROM error	
		15	External RAM error	
MECHANICAL ALARM	GOTHIC	10	Spacing error	Refer to flow chart ②.
		12	Homing error	Refer to flow chart ③.
		15	Bail Arm error	Refer to flow chart ③.
		17	Position sense error (SP motor doesn't stop.)	Replace the control board.
		20	FAN error (Power supply over-heat)	Refer to flow chart ③.
		PROP	Power down error (+38 V is too low.)	Refer to flow chart ①.
		10+PROP	Head Thermister error	Replace the Printhead.

Table 7.4

Conditions	LEDs			Comments
	Primary Message		Current PITCH Lamp	
	ALARM Lamp	SELECT Lamp		
Alarm 1	OFF	ON	ON	Unidirectional Printing
Alarm 2	OFF	ON	BLINK	Stops printing, and resume to print after cool down.

7.4 Parts Layout

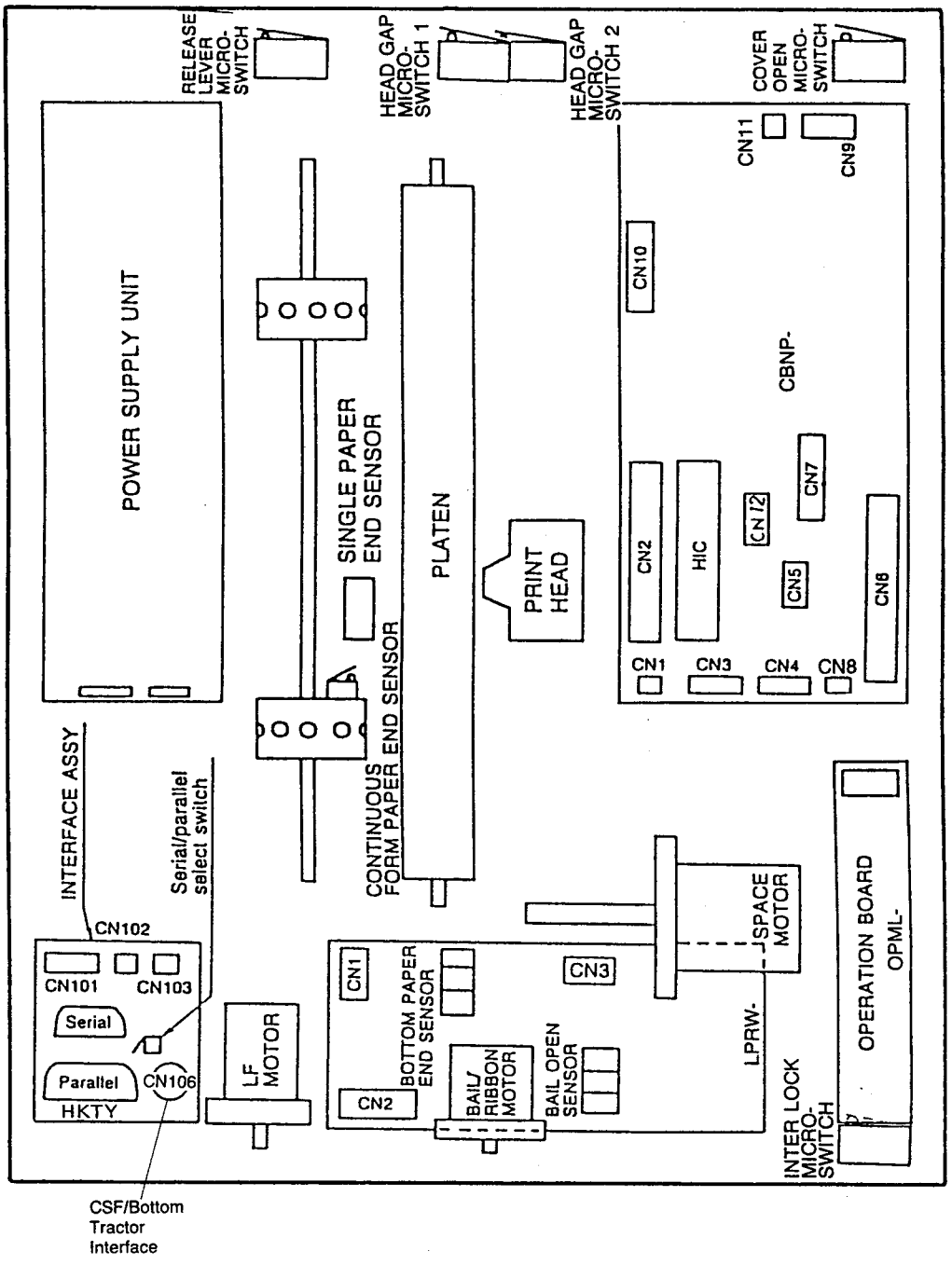
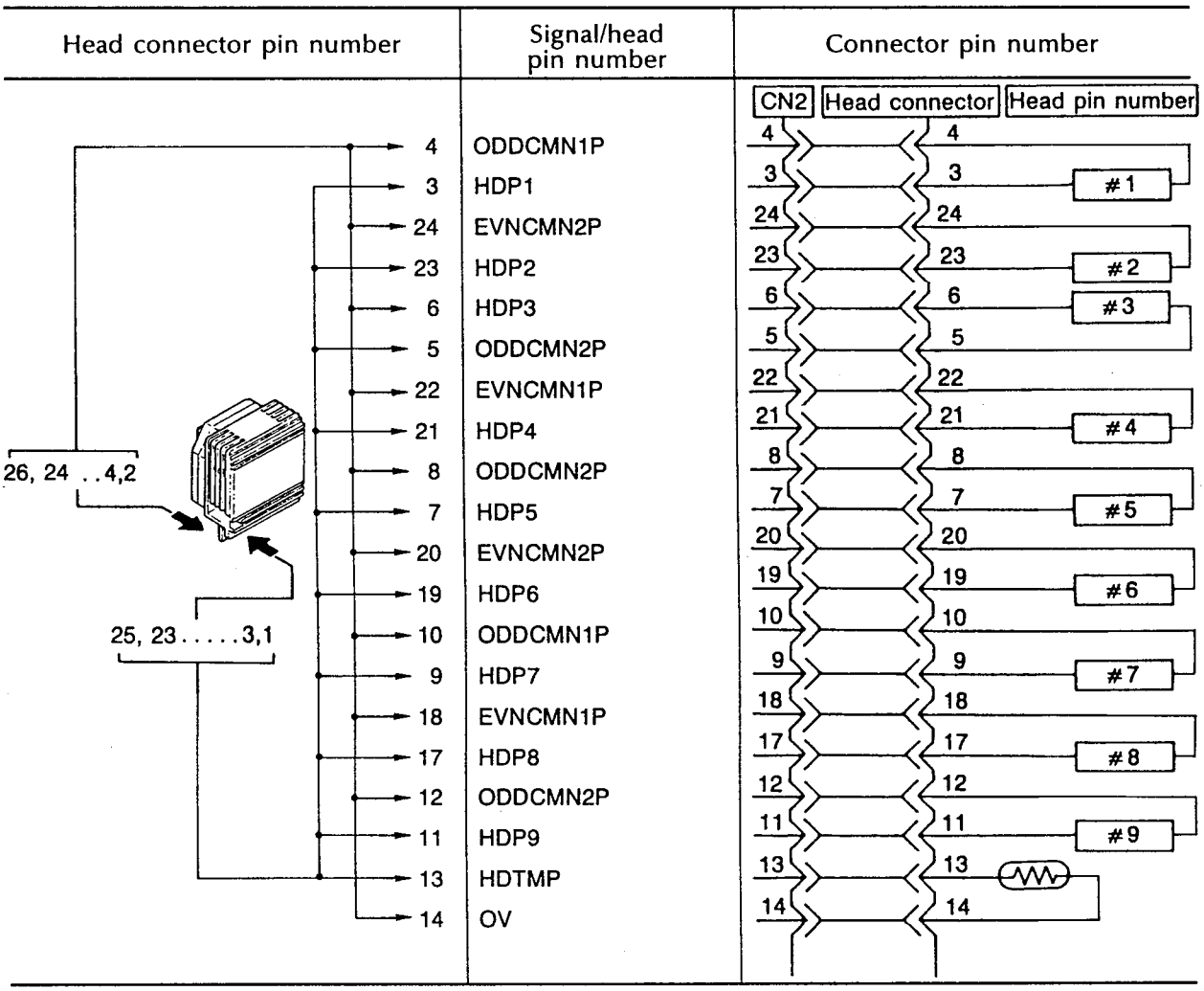


Figure 7-2

7.5 Connection Circuit and Resistance Check for Printhead and LF/SP/BAIL Motor

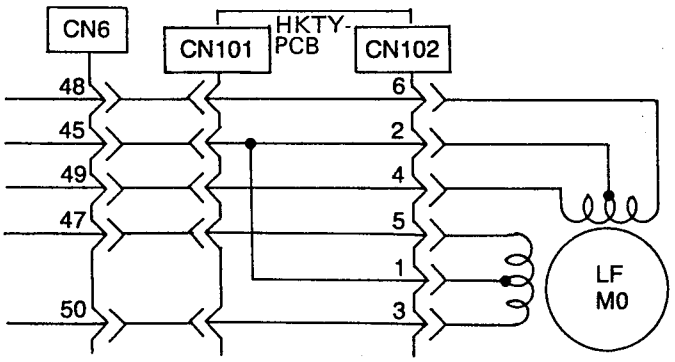
(1) Printhead

Resistance of each coil should be about 3Ω



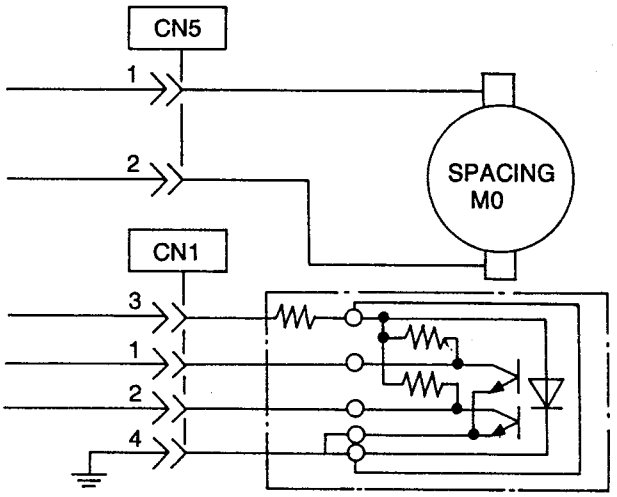
(2) Line feed motor

Resistance of each coil should be about 5.6Ω

Pin number of LF motor	Signal	Connector pin number
6	LFϕ1DV	
2	LFCOM	
4	LFϕ3DV	
5	LFϕ2DV	
1	(LFCOM)	
3	LFϕ4DV	

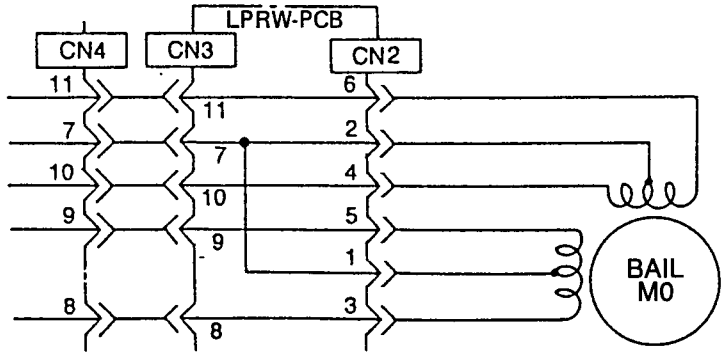
(3) Space motor

Resistance of motor should be about 5Ω

Pin number of SP motor	Signal	Connector pin number
1	SPM1	
2	SPM2	
3	+5V	
1	SPϕA	
2	SPϕB	
4	SG	

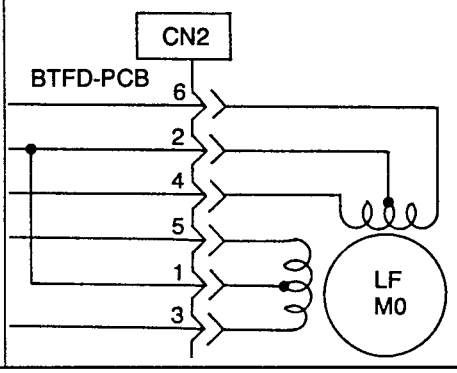
(4) Bail motor

Resistance of each coil should be about 34Ω

Pin number of Bail motor	Signal	Connector pin number
6	BMϕ1DV	
2	BMCOM	
4	BMϕ3DV	
5	BMϕ2DV	
1	(BMCOM)	
3	BMϕ4DV	

(5) Bottom feed motor

Resistance of each coil should be about 5.6Ω

Pin number of motor	Signal	Connector pin number
6	LFϕ1DV	
2	LFCOM	
4	LFϕ3DV	
5	LFϕ2DV	
1	(LFCOM)	
3	LFϕ4DV	

7.6 Troubleshooting Flow Chart

① **Power is not supplied.**

- Is the AC cable connected correctly?

YES NO

- Connect the AC cable correctly.

- Is fuse F1 on the power supply unit blown?

NO YES

- Replace fuse F1 (with same type and rated fuse).
- Remedied?

NO YES

- End

- Replace the power supply unit or connection cable. (See Section 4.3.20.)

- Are the +5 V and +38 V outputs in the control board provided?

  +38V: Check on the both ends of the capacitor C4.

  +5V : Check between the pin 40 of Q4 and ⊖ of C4. (See figure below.)

YES NO

- Are cables CN3 and CN7 on the control board connected correctly?

NO YES

- Replace the power supply unit or connection cable. (See Section 4.3.20.)

- Connect them correctly.

- Replace the control board. (See Section 4.3.7.)
- Remedied?

NO YES

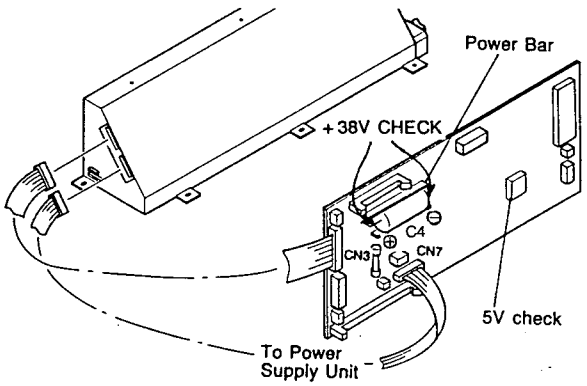
- End

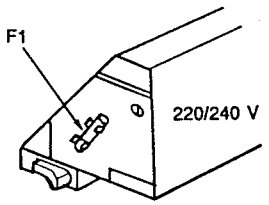
- Replace the operation panel connecting cable.
- Remedied?

NO YES

- End

- Replace the operation panel.





(2) **No spacing operation** (The alarm lamp blinks.)

- Is carriage assembly binding or Jammed?

NO YES

- Check around the space motor to repair the mechanism.

- Replace program ROM.
- Remedied?

NO YES

- End

- Is fuse F1 on the control board blown?

NO YES

- Replace fuse F1 (with same type and rated fuse).
- Remedied?

NO YES

- End

- Check continuity of CN12, pins 3 and 4. Is open circuit? (Proper reading 75 ohms)

NO YES

- Replace ballast resistor under operator panel housing.

- To step (A)

(A) • Is the +38 V output on the control board provided? (Check on the both ends of the capacitor C4.)

YES NO

- Are cables CN3 and CN7 on the control board connected correctly?

YES NO

- Connect them correctly.

- Replace the power supply unit or connection cable. (See Section 4.3.20.)

- Are cables CN1, CN5 and CN12 on the control board connected correctly?

YES NO

- Connect them correctly.

- Replace the Interlock switch assembly.
- Remedied?

NO YES

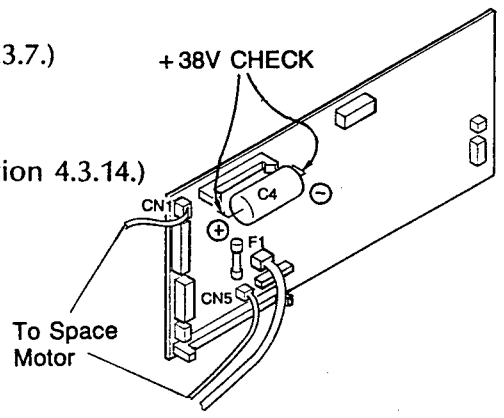
- End

- Replace the control board. (See Section 4.3.7.)
- Remedied?

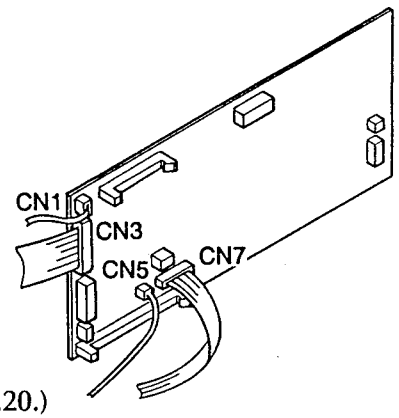
YES NO

- Replace the space motor. (See section 4.3.14.)

- End



③ Homing does not end normally.



- Bail alarm?

NO YES

- To step 3-2

- Fan alarm?

NO YES

- Replace the power supply unit. (See Section 4.3.20.)

- Head homing alarm?

NO YES

- Is the +38 V output on the control board proper?

YES NO

- Are the cables of CN3 and CN7 on the control board correctly connected to the power supply unit?

NO YES

- Replace the power supply unit. (See Section 4.3.20.)

- Connect them correctly.

- Is cable CN1 on the control board connected correctly?

YES NO

- Connect it correctly.

- Replace Interlock switch assembly.

- Remedied?

NO YES

- End

Ⓐ

- Replace the control board. (See Section 4.3.7.)
- Remedied?

NO YES

- End

- Replace the space motor. (See Section 4.3.14.)

3-1

3-1

- Turn off the power and manually move the carriage. Does it move smoothly?

NO YES

- To step (A)

- Is there paper or dirt on the spacing mechanism?

NO YES

- Remove it.

- Remove the ribbon cartridge.
- Does the carriage move smoothly?

NO YES

- Replace the ribbon cartridge.

- Replace the ribbon feed assembly. (See Section 4.3.13.)

3-2

- Manually rotate the bail open gear counterclockwise.
- Does it rotate smoothly?

YES NO

- Remove any paper scrap or foreign matter near the bail motor gear, idle gear and bail open gear.
- Check the meshing of each of the above gears.

- Is cable CN4 on the control board connected correctly?

YES NO

- Connect it correctly.

- Is cable CN2/CN3 on the sensor board connected correctly?

YES NO

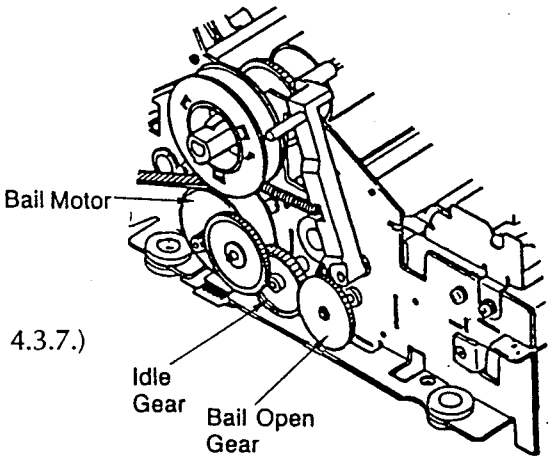
- Connect it correctly.

- Is there dirt or dust on any of the sensors on the sensor board?

NO YES

- Clean the sensor.

- Is bail arm L damaged?



NO YES

- Replace bail arm L.

- Replace the control board. (See Section 4.3.7.)
- Remedied?

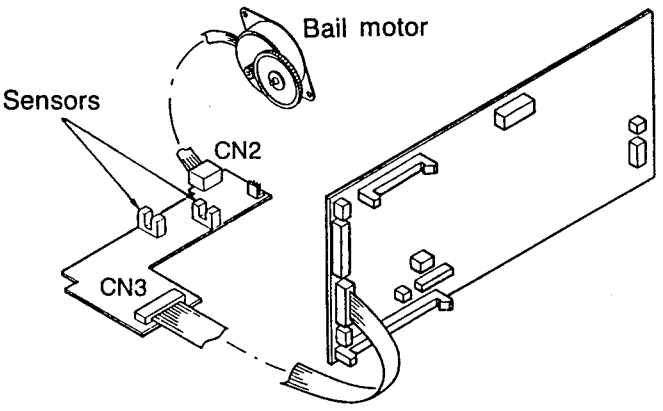
YES NO

- Replace the sensor board. (See Section 4.3.12.)
- Remedied?

YES NO

- Replace the bail motor. (See Section 4.3.16.)
- End

- End



④ Wrong character, character omission or dot omission

- Are cables CN2 and CN6 on the control board connected correctly?

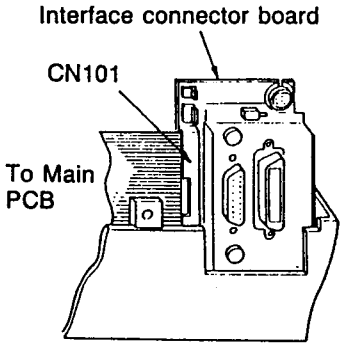
YES NO

- Connect them correctly.

- Is cable CN101 on the interface connector board connected correctly?

YES NO

- Connect it correctly.



- Is the interface cable connected correctly?

YES NO

- Connect it correctly.

- Are ±8V outputs on the control board provided?

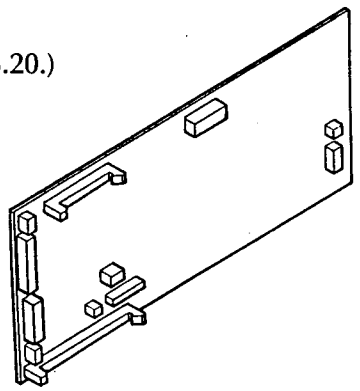
YES NO

- Are cables CN3 and CN7 on the control board connected correctly to the power supply unit?

YES NO

- Connect them correctly.
- Replace the power supply unit. (See Section 4.3.20.)

- Replace the printhead. (See Section 4.3.2.)
- Remedied?



YES NO

- Replace the program ROM.
- Remedied?

NO YES

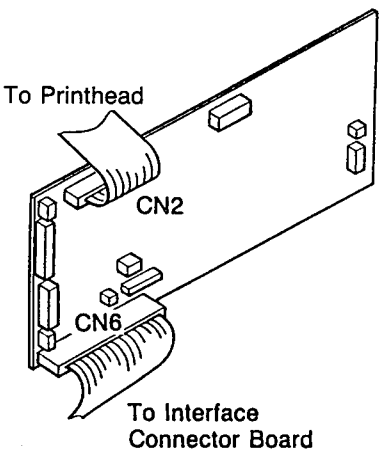
- End

- Replace the control board. (See Section 4.3.7.)
- Remedied?

NO YES

- End

- Do cables connected to CN2 and CN6 on the control board have internal open-circuit?



NO YES

- Replace the cable(s).

- To Step 4-1

- End

- Check the menu settings related to the interface.
  - Baud rate
  - Character format
  - Protocol
  - Busy signal output terminal selection

⑤ Ribbon feed trouble

- Remove the ribbon cartridge and rotate the ribbon cartridge ribbon feed knob.
- Does it rotate smoothly?

YES

NO

- Check to see if ribbon lock mechanism has been disengaged.
- Replace the ribbon cartridge.

- Manually shift the carriage to the left and to the right.
- Does the ribbon feed shaft rotate?

YES

NO

- Replace the ribbon feed assembly (See Section 4.3.13.)
  - After the replacement, it is necessary to adjust the backlash between the space motor gear and bevel gear. (See Section 5.3.)

- Check that the ribbon feed shaft is correctly engaged with the ribbon feed roller of the ribbon cartridge.

⑥ Line feed trouble

- Manually rotate the platen knob.
- Does it rotate smoothly?

YES NO

- Set the release lever to the open side.
- Does the platen knob rotate smoothly?

NO YES

- Correct paper setting.
- Remove any foreign matter or dust on the platen gear, idle gear or drive gear
- Smooth meshing of platen gear, idle gear and drive gear
- Correct phasing of push tractor assembly (R) or (L) (See Section 4.3.18.)
- Replacement of push tractor assembly (R) or (L). (See Section 4.3.18.)

- Adjust the LF motor mini pitch belt tension. (See Section 5.4.)
- Is cable CN6 on the control board connected correctly?

YES NO

- Connect it correctly.

- Is cable CN101 on the interface connector board connected correctly?

YES NO

- Connect it correctly.

- Is cable CN102 on the interface connector board connected correctly?

YES NO

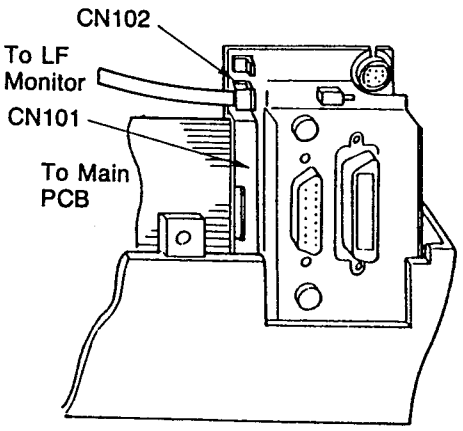
- Connect it correctly.

- Replace the control board. (See Section 4.3.7.)
- Remedied?

YES NO

- Replace the LF motor.
  (See Section 4.3.10.)
  After the LF motor replacement,
  belt tension adjustment is necessary.
  (See Section 5.4.)

- End



⑦ Malfunction of switch on operation board

- Is cable CN1 on the operation board connected correctly?

YES / NO

- Connect it correctly.

- Is cable CN10 on the control board connected correctly?

YES / NO

- Connect it correctly.

- Replace the connection cable.
- Remedied?

NO / YES

- End

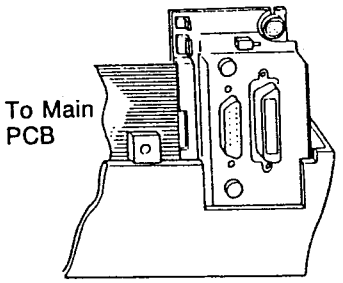
- Replace the operation board. (See Section 4.3.5.)
- Remedied?

YES / NO

- Replace the control board. (See Section 4.3.7.)

- End

⑧ Data receiving failure



- Is select lamp blinking?

NO YES

- Set menu to ignore DC3. (Print Suppress)

- Is the alarm lamp on?

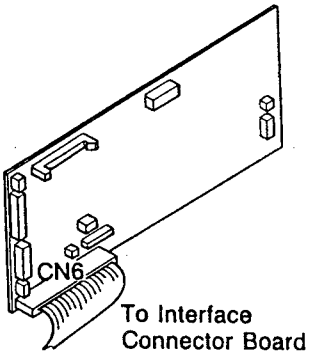
NO YES

- To Step 8-1

- Is the SELECT lamp on?

YES NO

- Set to the SELECT mode.



- Is the interface cable connected correctly?

YES NO

- Connect it correctly.

- Is cable CN101 on the interface connector board connected correctly?

YES NO

- Connect it correctly.

- Is cable CN6 on the operation board connected correctly?

YES NO

- Connect it correctly.

- Branch the search path depending on whether the interface is parallel or serial.

Parallel interface

- To Step Ⓐ

Serial interface

- Correctly set the interface menu parameters to match the system device.
  - Baud rate
  - Character format
  - Protocol
  - Busy signal polarity
- Remedied?

NO YES

- End

- Are ±8 V outputs provided on the control board?

YES NO

- Replace the power supply unit. (See Section 4.3.20.)

- To Step Ⓐ

Ⓐ • Replace the program ROM.
• Remedied?

YES NO

• Replace the control board. (See Section 4.3.7.)
• Remedied?

YES NO

• Replace the interface connector board. (See Section 4.3.6.).
• Replace the cable connected to CN6 on the control board.

• End

• End

8-1

- Remove the upper cover (See section 4.3.4.), and turn on the power with one hand while pressing the cover open microswitch with the other hand also attach adhesive tape to hold the Interlock switch.
- Does the alarm lamp come on?

YES NO

- Correctly connect cable CN11 on the control board.
- Check the correspondence between the front access cover and cover open lever.
- Replace the cover open microswitch cable assembly.

- Is the paper set?

YES NO

- Set the paper.

- Does the continuous form end microswitch function correctly?

YES NO

- Correctly connect CN103 on the interface connector board.
- Replace the rear push tractor assembly (L). (See Section 4.3.18.)

- Does the single sheet end sensor function correctly?

YES NO

- Check that there is no dirt or dust on the sensor surface.
- Correctly connect CN1 on the sensor board.
- Replace the sensor cable assembly.

- Does the bottom paper end sensor function correctly?

YES NO

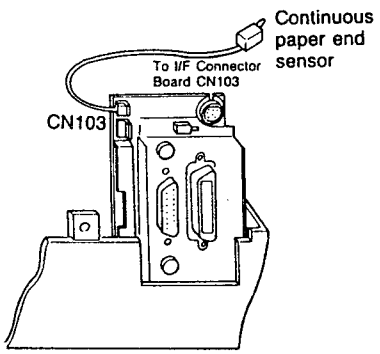
- Check that there is no dirt or dust on the sensor board.
- Correctly connect cable CN3 on the sensor board.
- Correctly connect cable CN4 on the control board.
- Replace the sensor board. (See Section 4.3.12.)

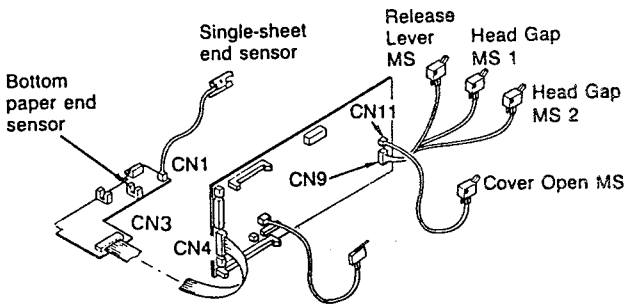
- Does the release lever microswitch function correctly?

YES NO

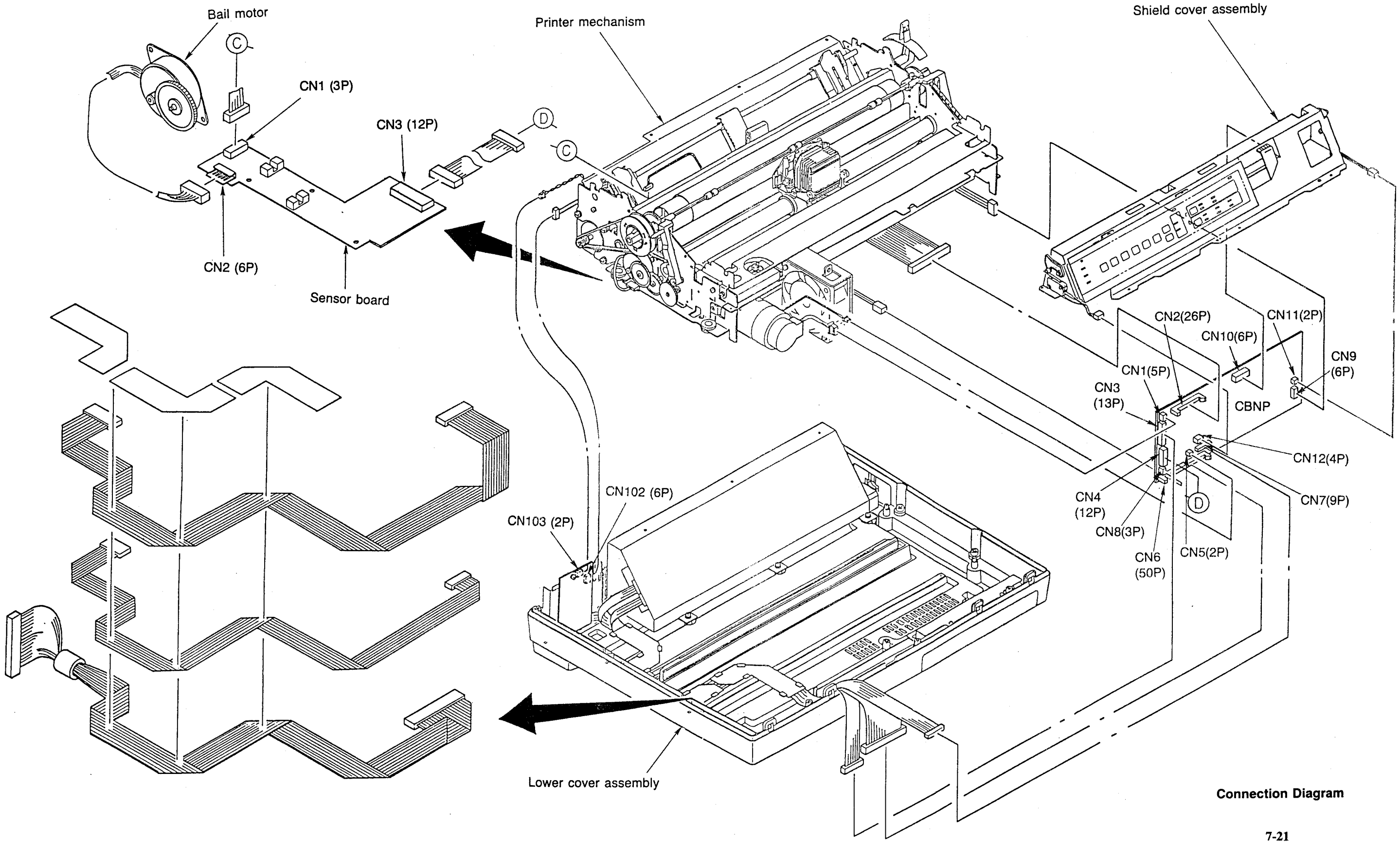
- Correctly connect cable CN9 on the control board.
- Replace the release lever, microswitch and cable assembly.

- Replace the control board. (See Section 4.3.7.)





7.7 Connection Diagram

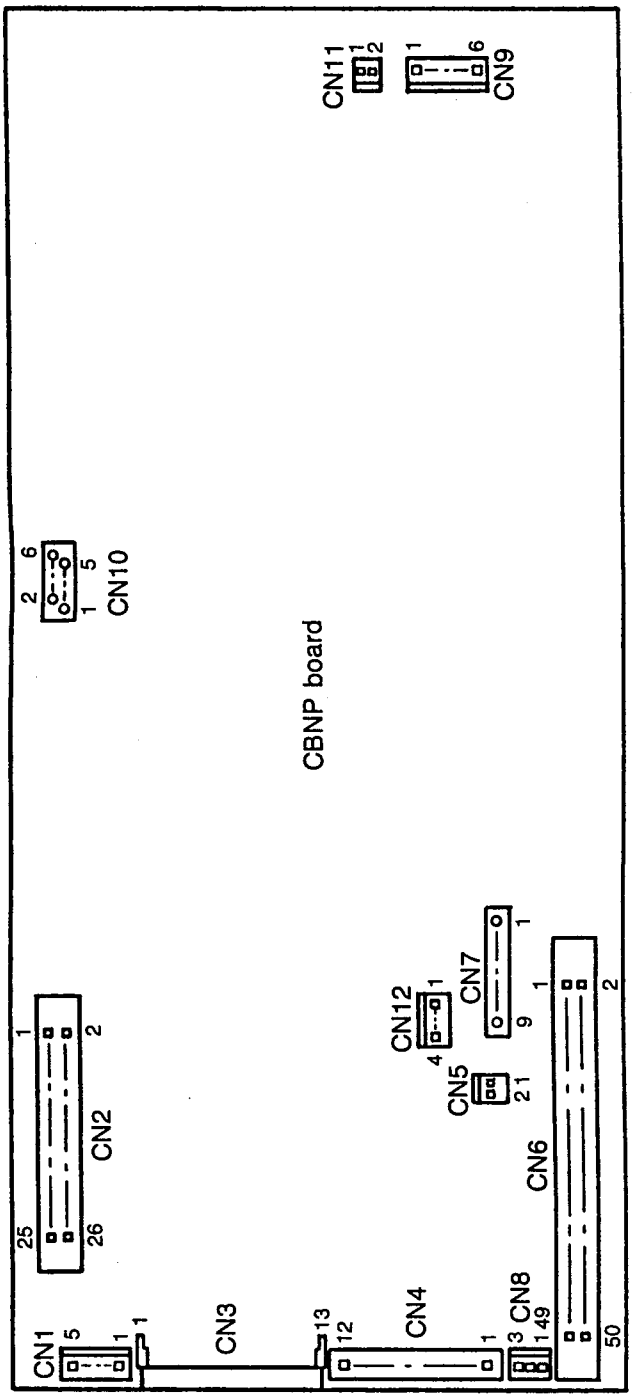


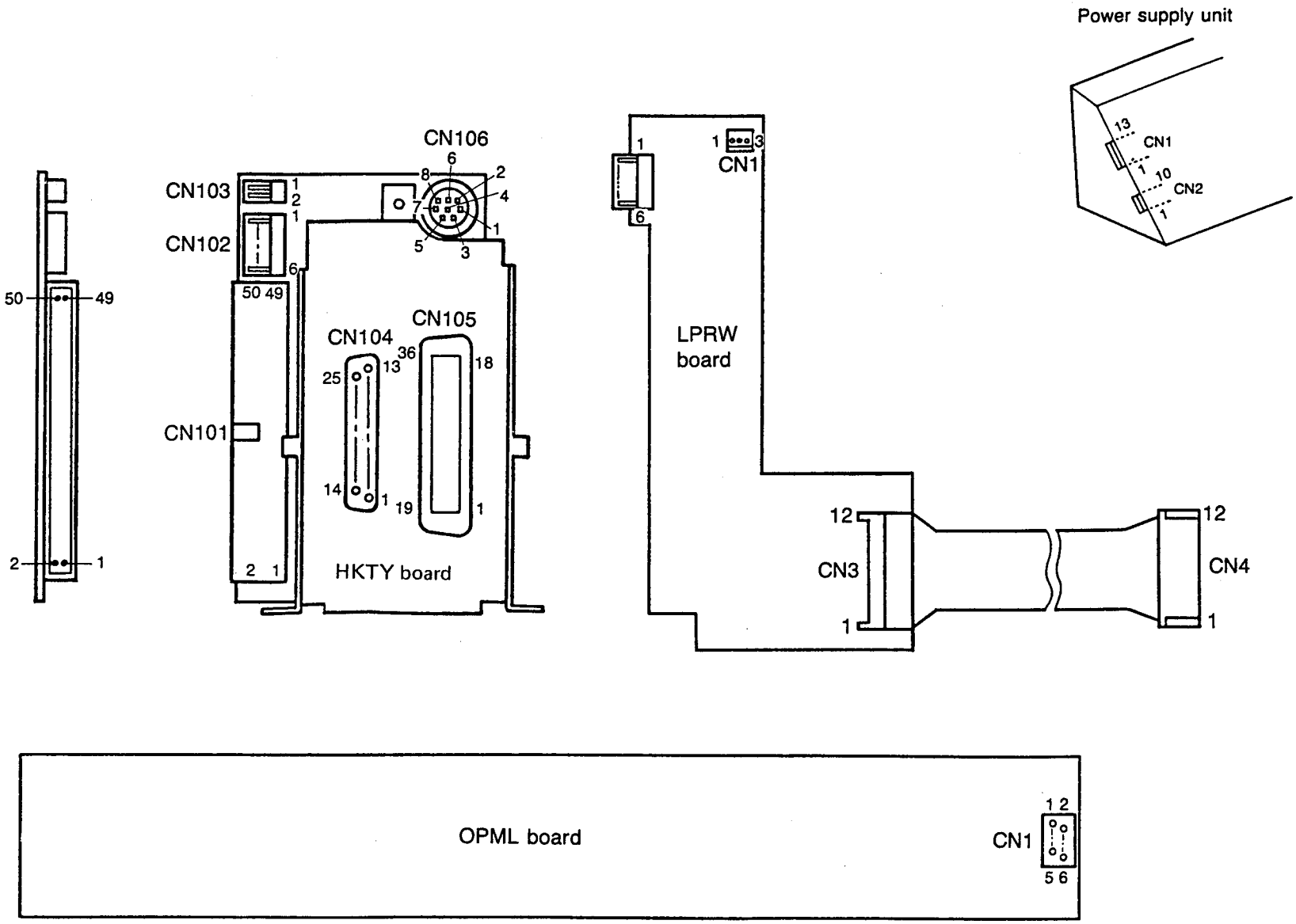
APPENDIX

A. PCB LAYOUT

— PCB List —

(1) Circuit board, CBNP (Main Controller)
(2) Circuit board, HKTY (Interface Connector Board)
(3) Circuit board, LPRW (Sensor Board)
(4) Circuit board, OPML (Operator Panel)
(5) Circuit board, BTFD (Bottom Push Tractor Controller)


CBNP board
CN1
CN2
CN3
CN4
CN5
CN6
CN7
CN8
CN9
CN10
CN11
CN12


Power supply unit
13
CN1
1
10
CN2
1
CN106
6
8
2
7
4
1
5
3
CN103
1
2
CN102
1
6
50 49
CN101
2 1
CN104
CN105
36
25
13
18
14
1
19
1
HKTY board
50
49
2
1
1
1
3
CN1
6
LPRW
board
12
CN3
1
12
CN4
1
OPML board
CN1
1 2
5 6

B. SIGNAL LIST

Abbreviation of signal name	Signal name	Function
+38V	+38 Volt	Power supply for drive circuit.
+5V	+5 Volt	Power supply for logical circuit.
+8V	+8 Volt	Power supply for RS-232 serial interface circuit.
−8V	−8 Volt	Power supply for RS-232 serial interface circuit.
0V	SIGNAL GROUND	Ground for logical circuit.
A0~A15	CPU ADDRESS BUS	Address bus signal of CPU (MSM67X640).
ACK-P	ACKNOWLEDGE	Centronics interface signal indicating that data reception is ready.
AD0~AD7	CPU ADDRESS/DATA BUS	Address/data bus signal of CPU (MSM67X640).
ALE-P	CPU ADDRESS LATCH ENABLE	The timing signal indicates the address latch timing on multiplex bus.
ALM-N	ALARM	Signal for detecting an abnormality in the drive circuit.
AUTOFEEDXT-N	AUTOMATIC PAPER FEED EXECUTE	Centronics interface signal indicating automatic line feed when CR code is received.
BAILOPN-N	PAPER BAIL OPEN	Bail bar open detection signal.
BELL-P	BUZZER ON	The buzzer control signal.
BM01~04DV-N	BAIL BAR FEED MOTOR PHASE n DRIVE	Bail bar feed motor phase current line.
BMCOM-P	BAIL BAR FEED MOTOR COMMON	Bail bar feed motor common line.
BMOVDV-P	BAIL BAR FEED MOTOR OVER DRIVE	Bail bar feed motor high voltage apply command.
BMPH1~4-P	BAIL BAR FEED MOTOR PHASE n DRIVE	Bail bar feed motor phase existing command.
BOTTOMPE-P	BOTTOM PATH PAPER END	Bottom path paper end.
BUSY-N	BUSY	Centronics interface signal indicating that data is under processing.
CD	CARRIER DETECT	RS-232 serial interface signal indicates under sending.
CEN5V-P	+5V LINE OUT to INTERFACE	The +5V line out to centronics interface.
CENTRO5V-N	+5V LINE OUT to INTERFACE	The +5V out command to centronics interface.
CENTROSEL-N	CENTRONICS INTERFACE SELECT	Indicates that the centronics interface is being select.

Abbreviation of signal name	Signal name	Function
CLKOUT-P	CPU CLOCK OUT	LSI driving clock from CPU.
CONTPE-N	CONTINUOUS PAPER END	Continuous paper end.
COVOPEN-N	COVER OPEN (LOGICAL)	Access cover open (logical) signal.
CPURST-P	CPU RESET OUT	Reset signal to LSI from CPU.
CS1-N	CHIP SELECT 1	CPU chip select 1 control signal (DRAM).
CSFCMD1,2N	CUT-SHEET FEEDER COMMAND	CSF interface signal, Operation command signal.
CSFCNCT-N	CUT-SHEET FEEDER CONNECT	CSF interface signal that goes low level when CSF is connected.
CSFPE-N	CUT-SHEET FEEDER PAPER END	CSF interface signal indicating that CSF hopper paper end.
CTS	CLEAR TO SEND	RS-232 serial interface signal indicating that the printer is ready for reception.
CURLIMIT-N	SPACING MOTOR DRIVE CURRENT-LIMIT	Spacing motor current-limit signal.
CUTPLV	CUT PAPER END	The cut paper end sensor output line.
CUTPOUT-N	CUT-SHEET PAPER END SENSOR STABILIZATION	Cut-sheet paper end sensor stabilization command signal.
D8~D15	CPU DATA BUS	Data bus signal of CPU (MSM67X640).
DATABIT1~8	RECEIVE DATA	Receive data on centronics interface.
DSR	DATA SET READY	RS-232 serial interface indicating that the host side is ready for data sending.
DTR	DATA TERMINAL READY	RS-232 serial interface signal indicating the ready state for reception.
EEPROMCLK-P	EEPROM CLOCK	EEPROM input data storing signal.
EEPROMCS-P	EEPROM CHIP SELECT	EEPROM selection signal.
EEPROMDI	EEPROM DATA IN	Write signal line into EEPROM.
EEPROMDO	EEPROM DATA OUT	dAta read-out line from EEPROM.
EP	POWER GROUND	Ground of driving circuit system.
ERROR-N	ERROR	Centronics interface signal indicating that the printer is in error state.
EVCM-P	EVEN PIN COMMON	Common driving command of even pin.
EVNCMN1P,2P	EVEN PIN COMMON	Common driving signal of even pin.
FANOFF-N	FAN OFF	The FAN control signal.
FANOFFPOW	FAN OFF TO POWER SUPPLY	The signal to cause the fan to be turned off when cooling by fan is not necessary.

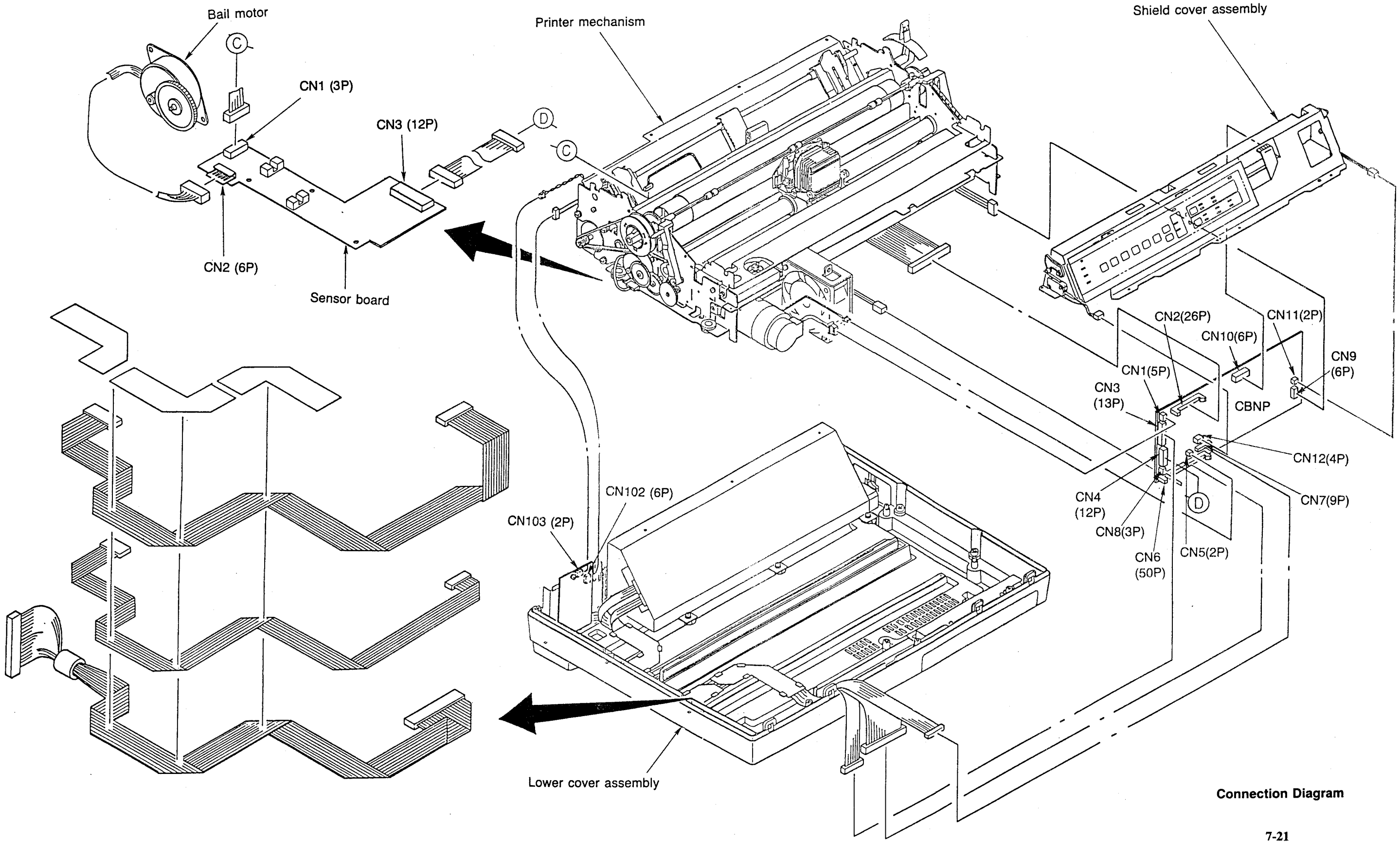
Abbreviation of signal name	Signal name	Function
FAULT-P	FAULT	Centronics interface signal indicating that the printer is in error state.
FG	FRAME GROUND	Ground for maintenance.
FORSINK-P	SPACING MOTOR FORWARD CURRENT SINK	Signal for controlling DC-space motor drive current to forward rotation.
HD1-N ~ HD9-N	PRINT HEAD PIN DRIVE	Printhead pin drive signal.
HDGAP1,2-N	HEAD GAP	The signal to distinguish the thin paper from the cardboard.
HDIPT-N	HEAD/SPACE INTERRUPT	The signal line to interrupt CPU when a printhead impacts or spacing timing.
HDTEMP	PRINT HEAD TEMPERATURE	Temperature sensor output in the print head.
HEAD1 ~ 9-P	PRINT HEAD PIN DRIVE	Printhead pin drive command.
I/F-H-LEVEL	INTERFACE HIGH LEVEL	Centronics interface signal, Power supply line for external units.
I/ORST-N	LSI RESET	I/O(LSI) reset signal.
IFDATA0 ~ 7	RECEIVED DATA	Received data on centronics interface.
IFIPT-N	INTERFACE LSI INTERRUPT	The signal line to interrupt CPU when an interface receives data by one byte.
IPRIME-N	INPUT-PRIME	Centronics interface signal indicating the command for printer initialization.
LF01 ~ 04DV-N	LINE FEED DRIVER PHASE n DRIVE	Line feed motor phase current line.
LFCHOP-P	LINE FEED MOTOR CHOPPING	Control signal for line-feed motor current suppression.
LFCOM-P	LINE FEED MOTOR COMMON	Line feed motor common line.
LFOVDV-P	LINE FEED MOTOR OVER DRIVE	Line feed motor high voltage apply command.
LFPH1 ~ 4-P	LINE FEED DRIVER PHASE n DRIVE	Line feed motor phase existing command.
ODCM-P	ODD PIN COMMON	Common driving command of odd pin.
ODDCMN1P,2P	ODD PIN COMMON	Common driving signal of odd pin.
OPCLK-P	OPERATION PANEL LSI CLOCK	Operation panel LSI read/write timing signal.
OPIN	OPERATION PANEL DATA IN	Operation panel LSI read data line.
OPLOAD-P	OPERATION PANEL LSI SEQUENCE CLEAR	The signal to clear the LSI sequence on operation panel.
OPOUT	OPERATION PANEL DATA OUT	Operation panel LSI write data line.

Abbreviation of signal name	Signal name	Function
PCBTMPCHK	THRESHOLD LINE for PCB TEMPERATURE	Not used.
PEND-N	PAPER END	Centronics interface signal, Paper end signal.
POWLOW-N	POWER SUPPLY LOW	Power supply overload signal.
PSEN-N	CPU PROGRAM STORE ENABLE	The timing signal for CPU to read an external program.
PWLEVEL	DRIVING POWER (+38V) LEVEL	The signal indicates the driving power level.
RAS0-N	RAW ADDRESS STROBE	The DRAM control signal indicates raw address strobe timing.
RD	RECEIVED DATA	RS-232 serial interface signal line that indicates received data.
RD-N	READ	CPU data read signal.
RELEASSW-N	PLATEN LOCK RELEASE LEVER	Platen lock release lever state signal.
RESET-N	CPU RESET	The CPU reset signal.
RTS	REQUEST TO SEND	RS-232 serial interface signal indicating the ready state for reception.
RVSSINK-P	SPACING MOTOR REVERSE CURRENT SINK	Signal for controlling DC-space motor drive current to reverse rotation.
SELECT-N	SELECT	Reception ready signal.
SELECTIN-N	SELECT IN	The DC1/DC3 code is valid only when this signal is high.
SPFWD-P	SPACING MOTOR FORWARD	Spacing motor forward rotation command signal.
SPLMT1,2-N	SPACING MOTOR DRIVE CURRENT-LIMIT SET	Spacing motor current-limit setting signal.
SPM1,2	SPACING PHASE 1,2	Spacing motor current line.
SPPHA	SPACING MOTOR SLIT ENCODER PHASE A	Spacing motor slit encoder phase A output.
SPPHB	SPACING MOTOR SLIT ENCODER PHASE B	Spacing motor slit encoder phase B output.
SPRVS-P	SPACING MOTOR REVERSE	Spacing motor reverse rotation command signal.
SSD	SUPERVISORY SEND DATA	RC-232 serial interface signal indicating the ready state for reception.
STB-N	DATA STROBE	Centronics interface signal.
TD	TRANSMITTED DATA	RS-232 serial interface signal line that indicates send data to HOST.
WR-N	WRITE	CPU data write signal.

C. CIRCUIT DIAGRAM

Figure 10-1 Main controller PCB (CBNP-1/10) circuit diagram (PCB REV 3)
Figure 10-2 Main controller PCB (CBNP-2/10) circuit diagram (PCB REV 3)
Figure 10-3 Main controller PCB (CBNP-3/10) circuit diagram (PCB REV 3)
Figure 10-4 Main controller PCB (CBNP-4/10) circuit diagram (PCB REV 3)
Figure 10-5 Main controller PCB (CBNP-5/10) circuit diagram (PCB REV 3)
Figure 10-6 Main controller PCB (CBNP-6/10) circuit diagram (PCB REV 3)
Figure 10-7 Main controller PCB (CBNP-7/10) circuit diagram (PCB REV 3)
Figure 10-8 Main controller PCB (CBNP-8/10) circuit diagram (PCB REV 3)
Figure 10-9 Main controller PCB (CBNP-9/10) circuit diagram (PCB REV 3)
Figure 10-10 Main controller PCB (CBNP-10/10) circuit diagram (PCB REV 3)
Figure 10-11 Operator panel PCB (OPML-1/1) circuit diagram (PCB REV 3)
Figure 10-12 Power supply circuit diagram (220/240)

7.7 Connection Diagram



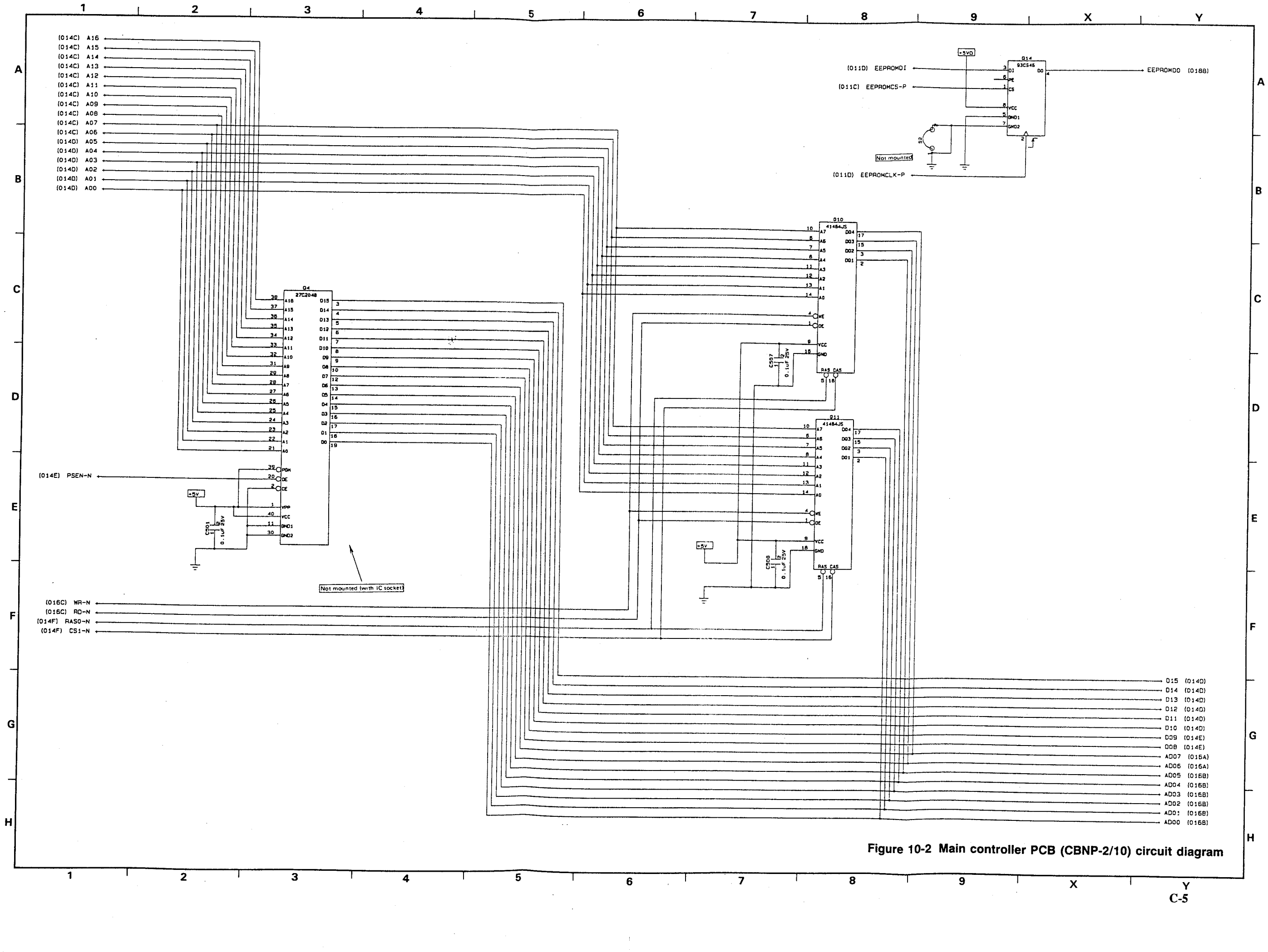


Figure 10-2 Main controller PCB (CBNP-2/10) circuit diagram

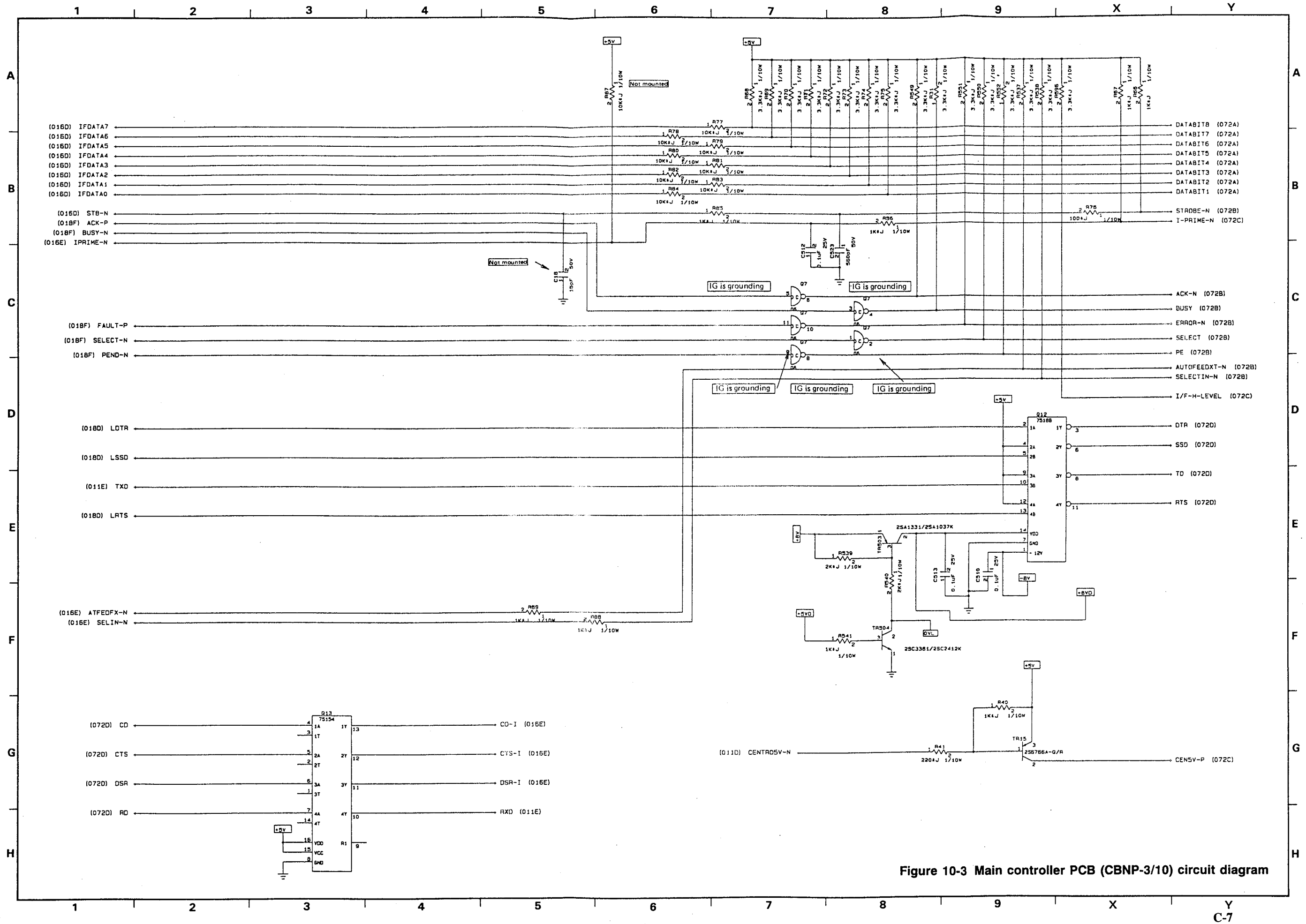


Figure 10-3 Main controller PCB (CBNP-3/10) circuit diagram

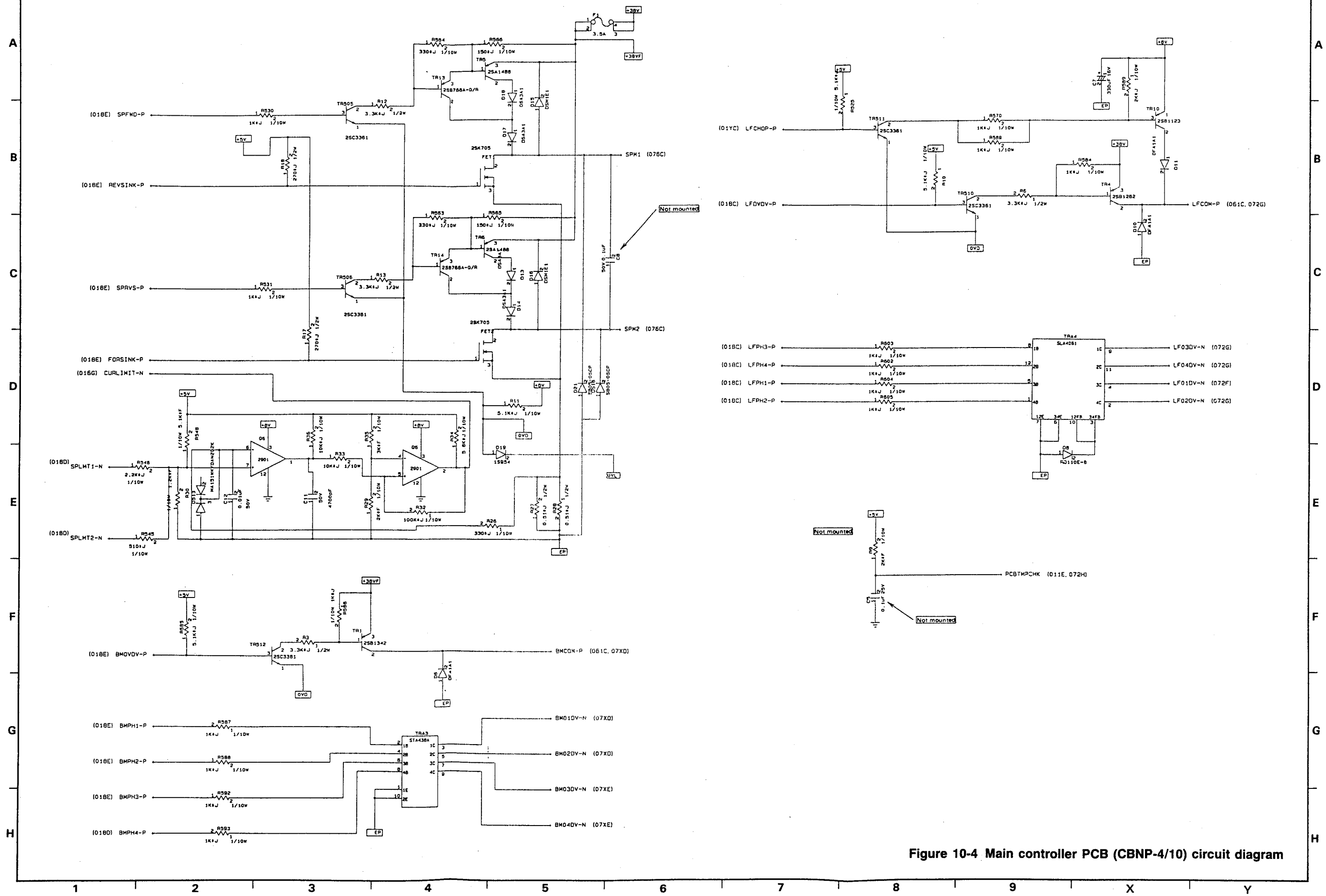


Figure 10-4 Main controller PCB (CBNP-4/10) circuit diagram

C4 is located close to +38V of
the circuit of the head drive and the EP.

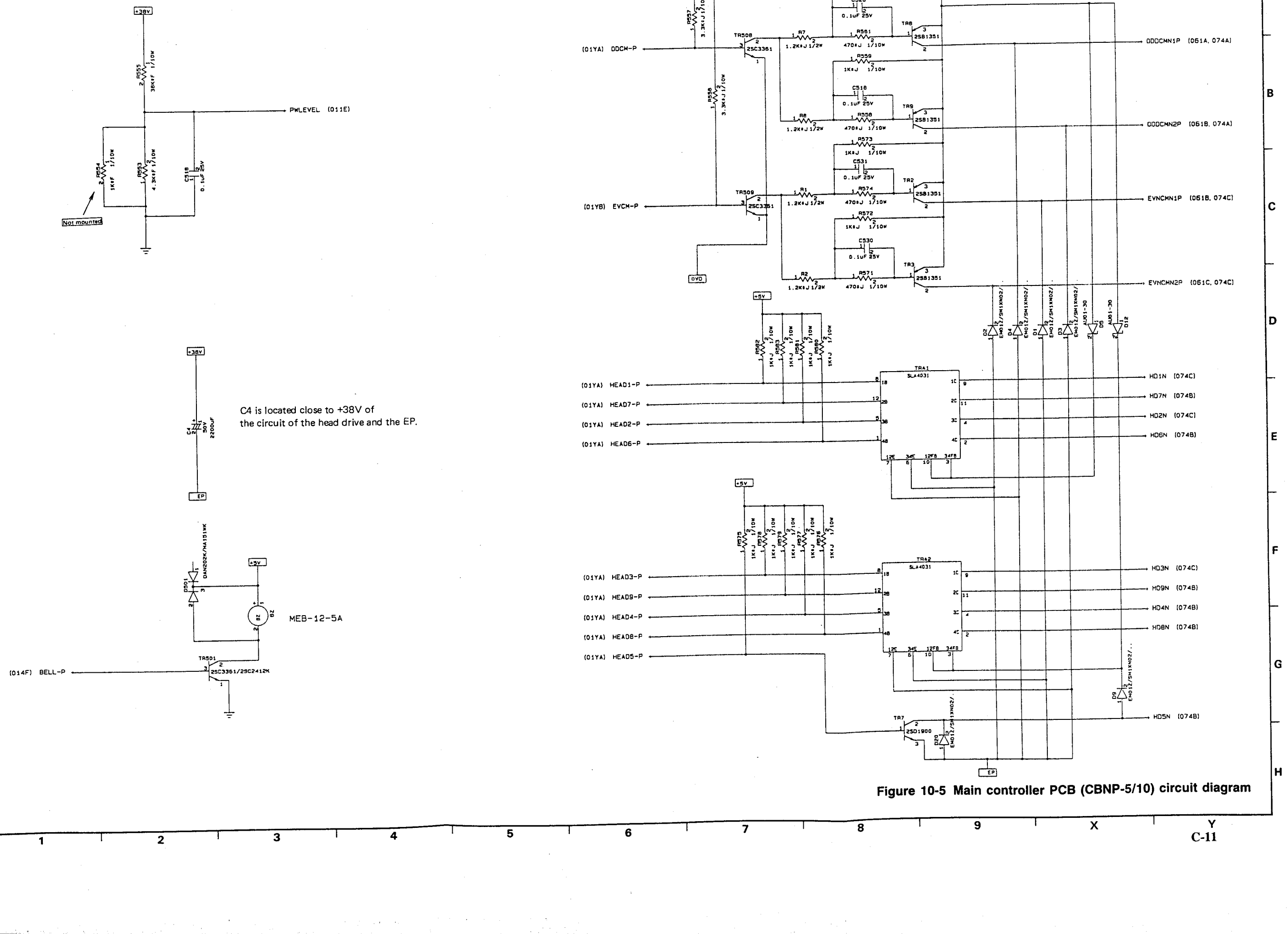


Figure 10-5 Main controller PCB (CBNP-5/10) circuit diagram

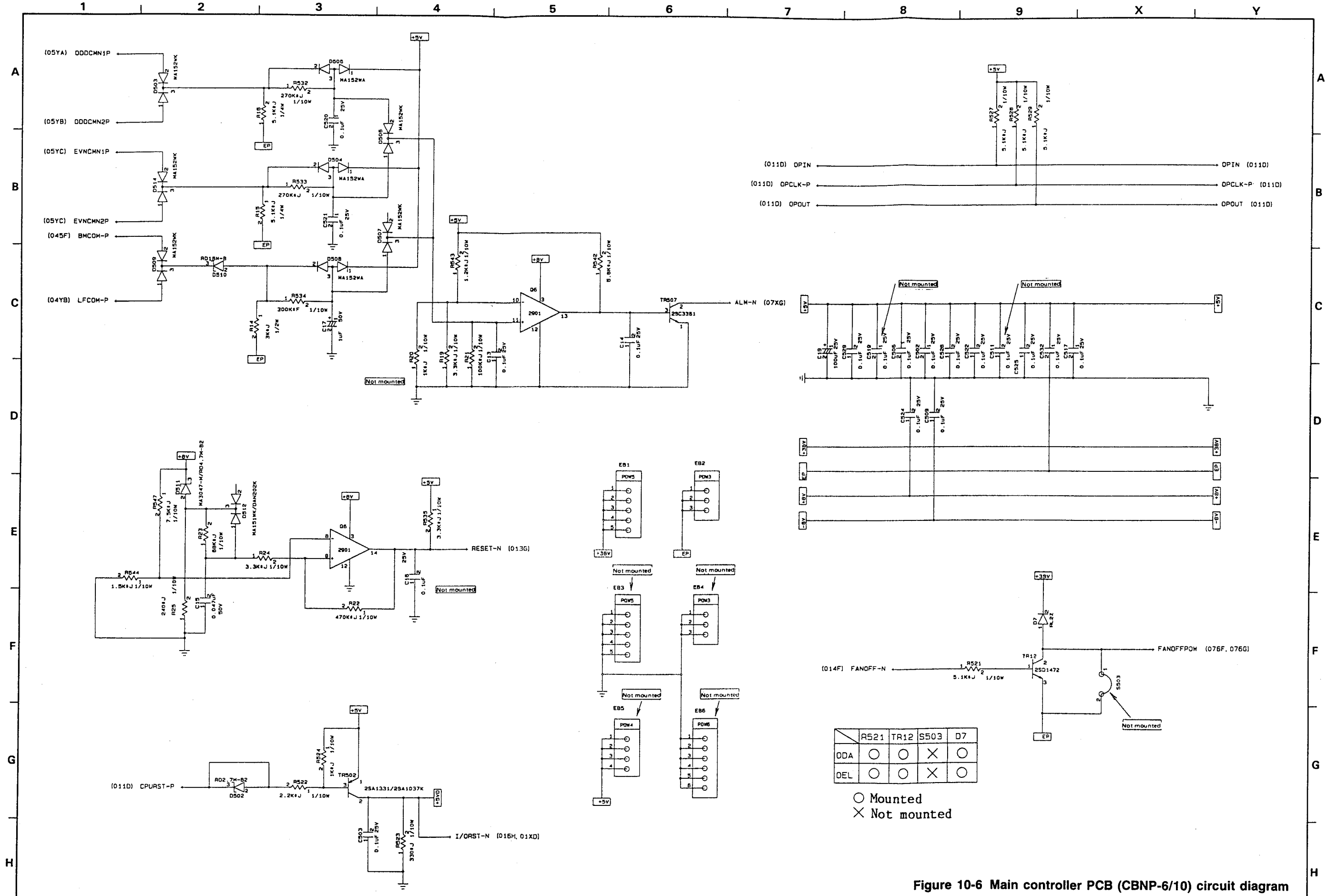
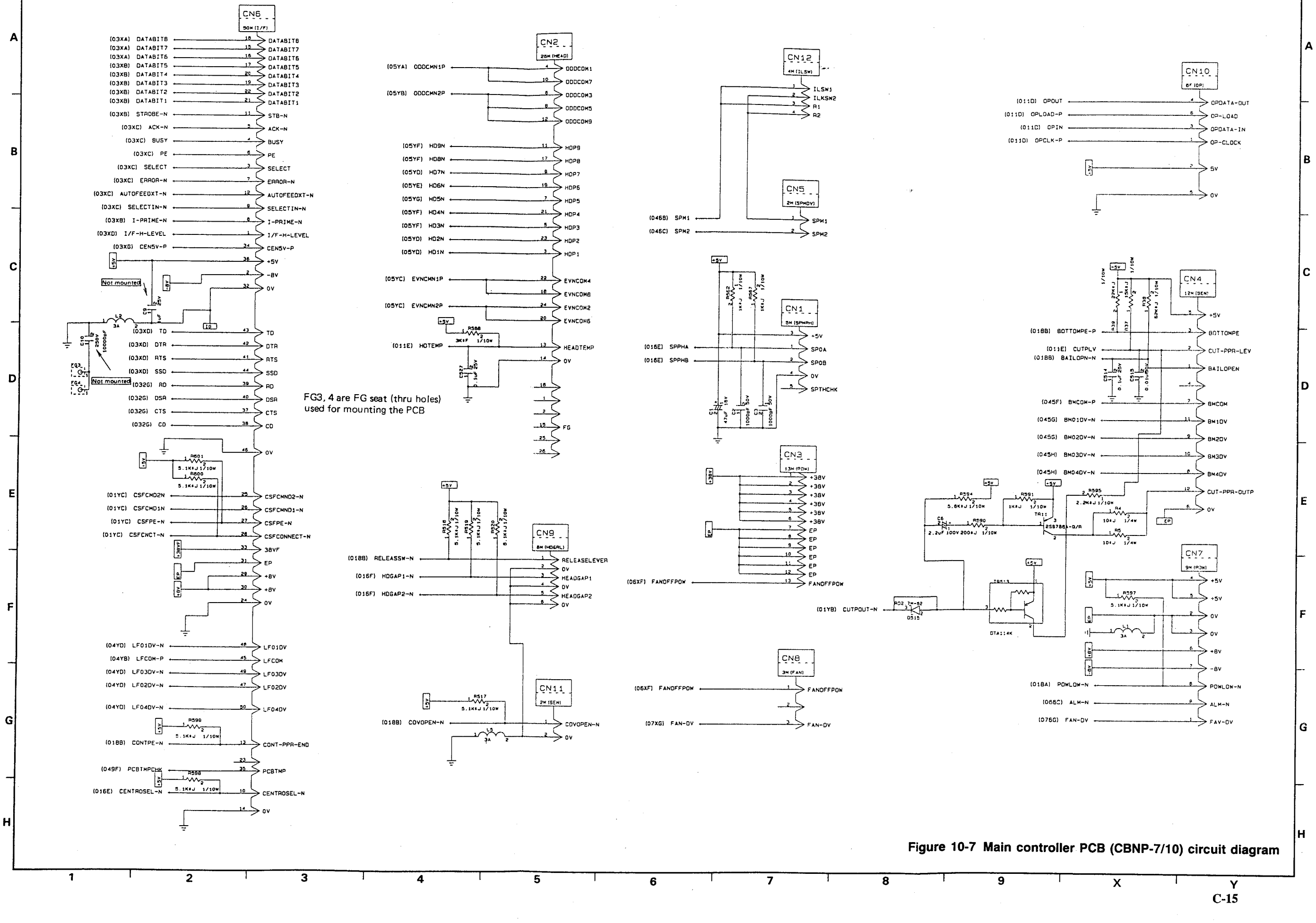
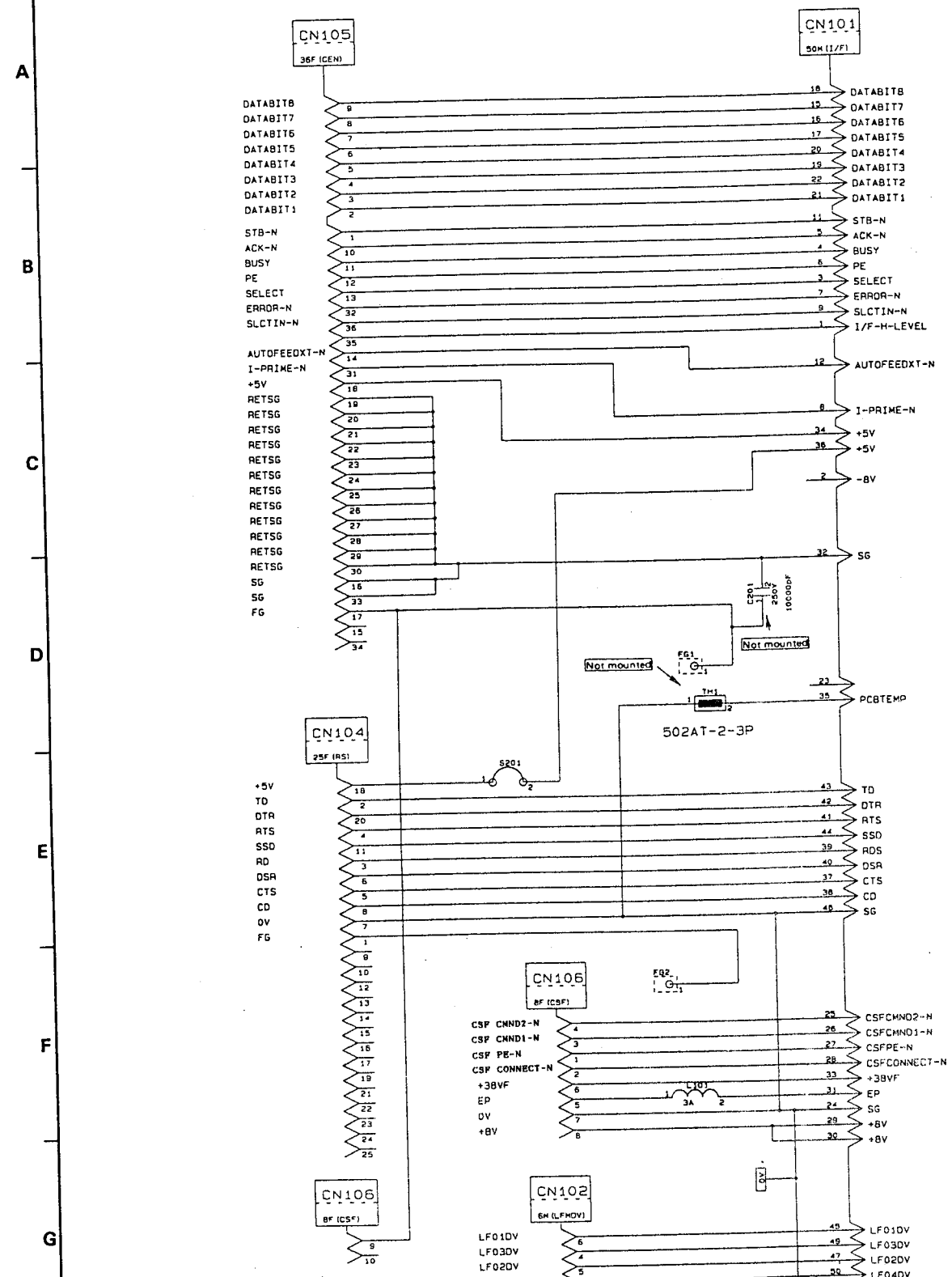


Figure 10-6 Main controller PCB (CBNP-6/10) circuit diagram



FG3, 4 are FG seat (thru holes) used for mounting the PCB

Figure 10-7 Main controller PCB (CBNP-7/10) circuit diagram

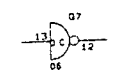


Pins 9 and 10 of CN106 are for installing

This page is of I/F connector board (HKTY)

CN104 and 105 are one assembly and are represented in drawing 220A1437P0001

IG is grounding



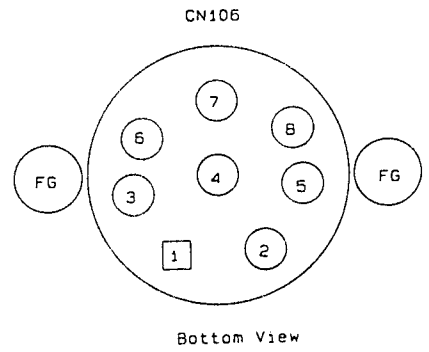
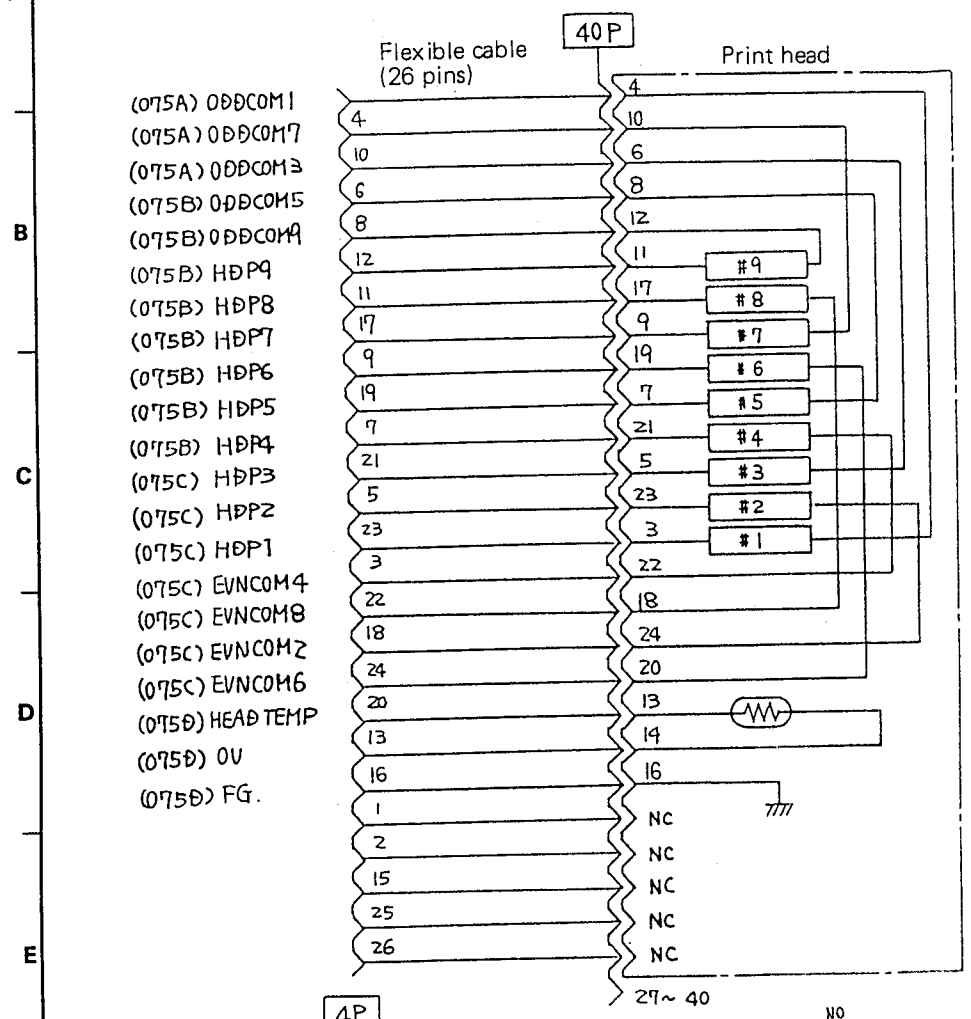
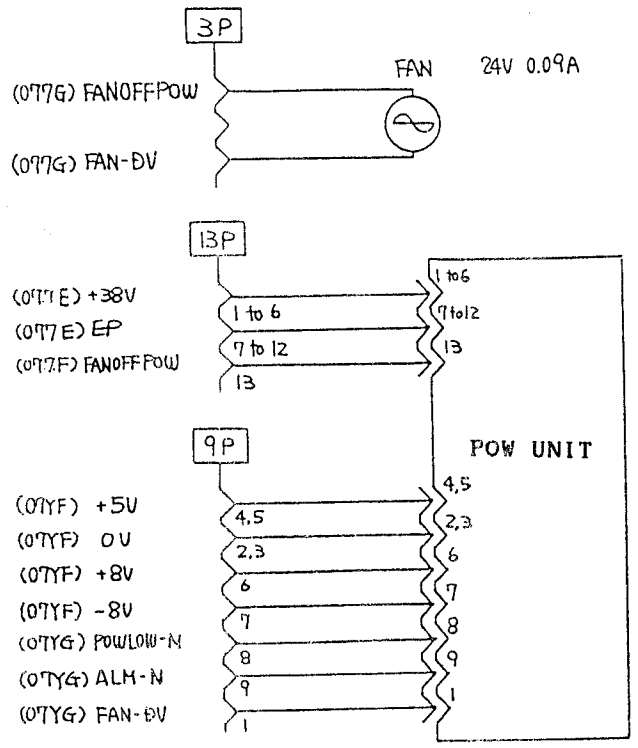
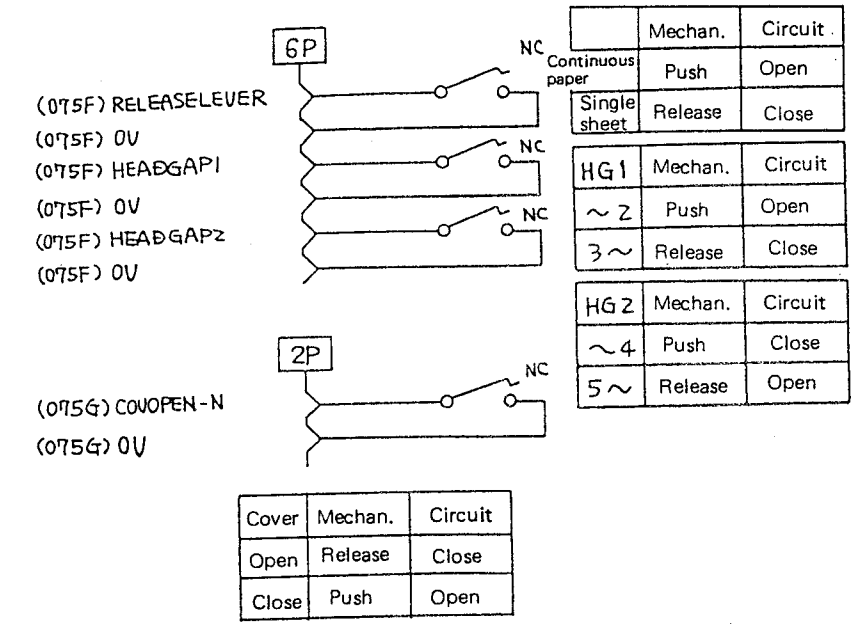


Figure 10-8 Main controller PCB (CBNP-8/10) circuit diagram







	Mechan.	Circuit
Continuous paper	Push	Open
Single sheet	Release	Close

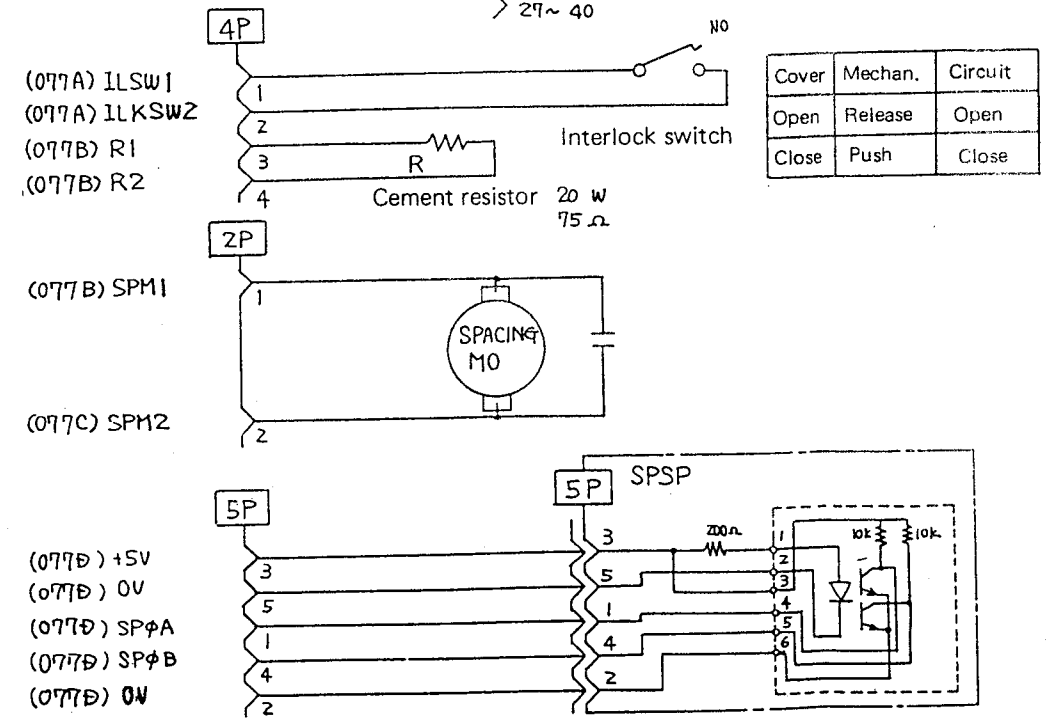
HG1	Mechan.	Circuit
~2	Push	Open
3~	Release	Close

HG2	Mechan.	Circuit
~4	Push	Close
5~	Release	Open

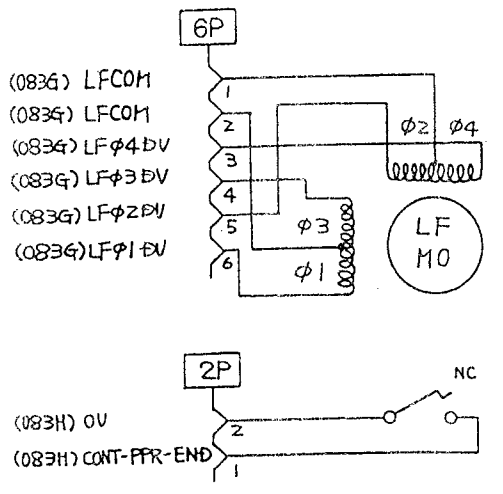
Cover	Mechan.	Circuit
Open	Release	Close
Close	Push	Open

Table showing combinations of head gap switches (2 pcs.)

Range	HG SW1		HG SW2		HEAD GAP1	HEAD GAP2
	Mechan.	Circuit	Mechan.	Circuit		
1,2	Push	Open	Release	Close	1	0
3,4	Release	Close	↑	↑	0	0
5~	↑	↑	Push	Open	0	1



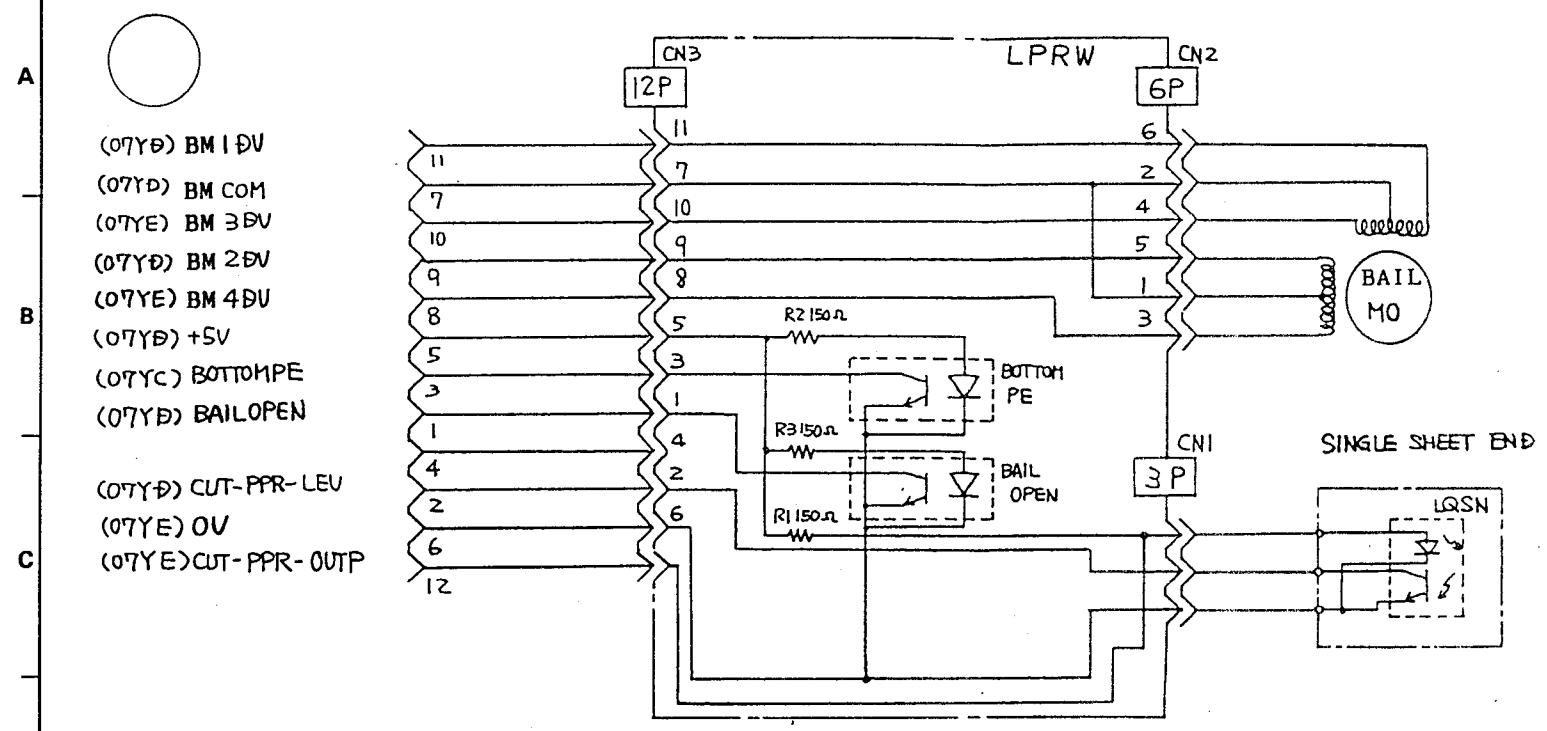
Cover	Mechan.	Circuit
Open	Release	Open
Close	Push	Close



Rear continuous paper

Paper	Mechan.	Circuit
Used	Push	Open
Unused	Release	Close

Figure 10-9 Main controller PCB (CBNP-9/10) circuit diagram

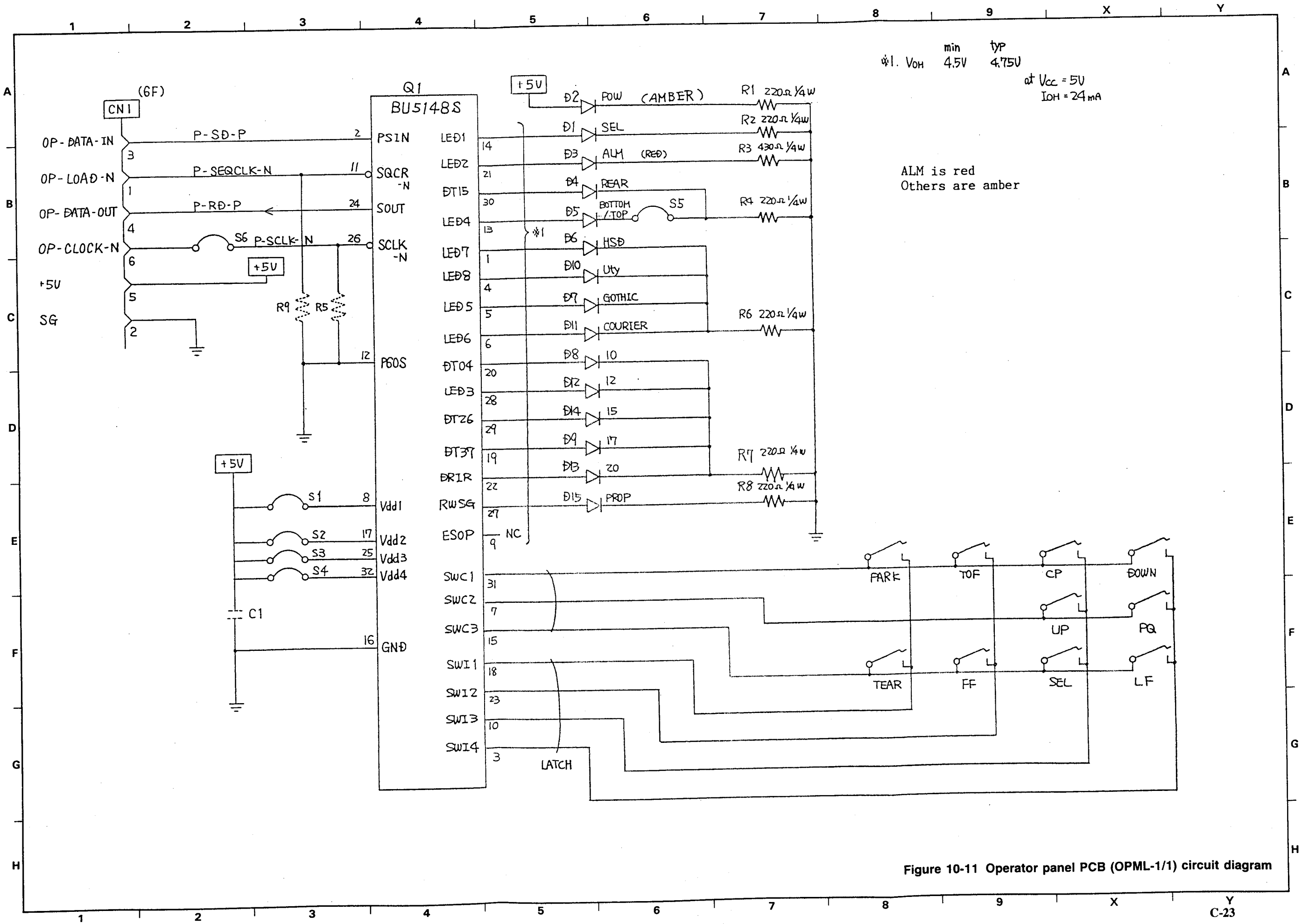


Bottom	Mechan.	Circuit
With paper	Feeding	Low
Without paper	Stop	Hi

Bail	Mechan.	Circuit
Open	Feeding	Low
Close	Stop	Hi

Single sheet	Mechan.	Circuit
With paper	Reflection	Low
Without paper	Feeding	Hi

Figure 10-10 Main controller PCB (CBNP-10/10) circuit diagram



※1. V_{OH} min 4.5V typ 4.75V at V_{CC} = 5V, I_{OH} = 24 mA

ALM is red
Others are amber

Figure 10-11 Operator panel PCB (OPML-1/1) circuit diagram

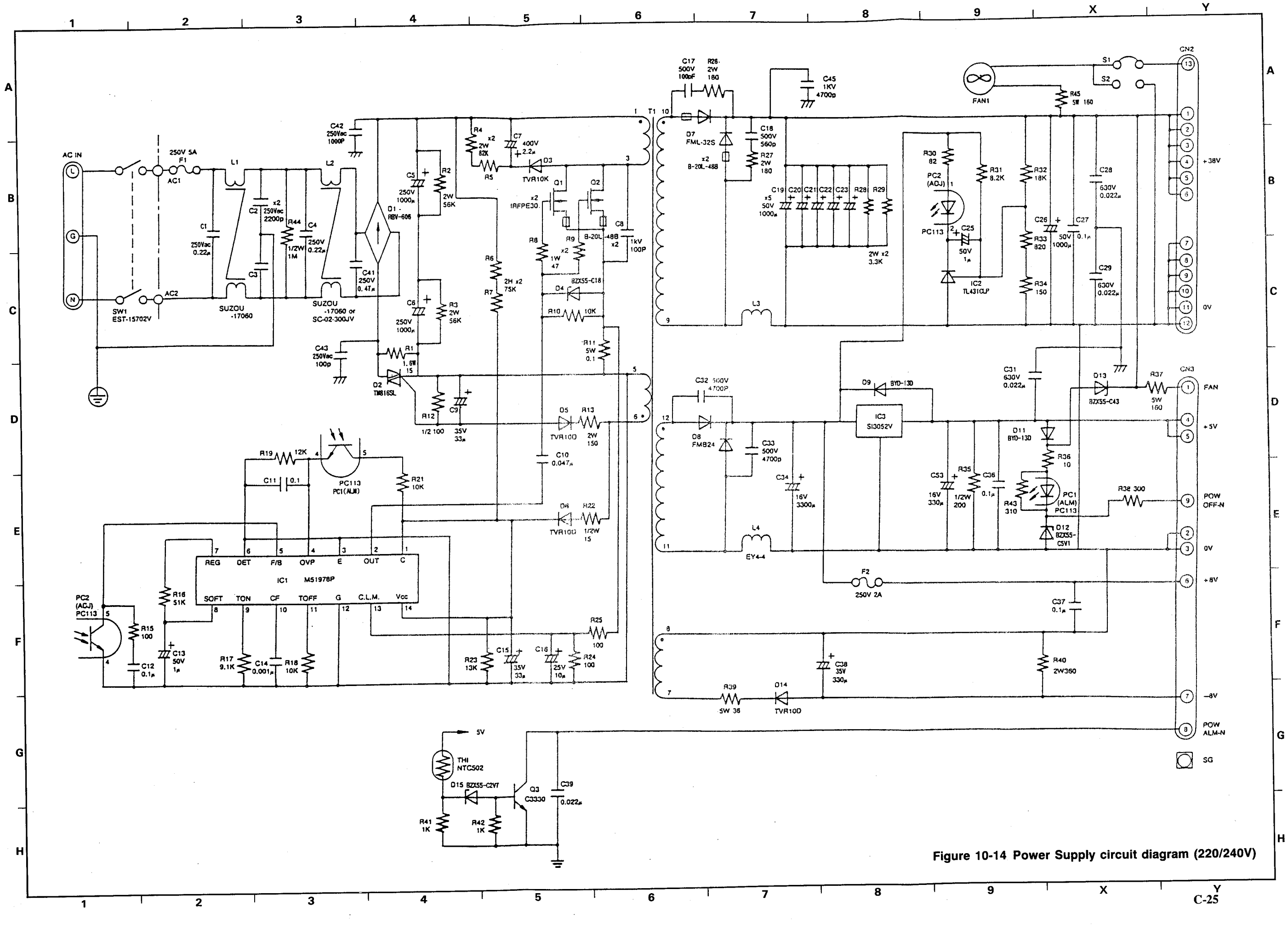
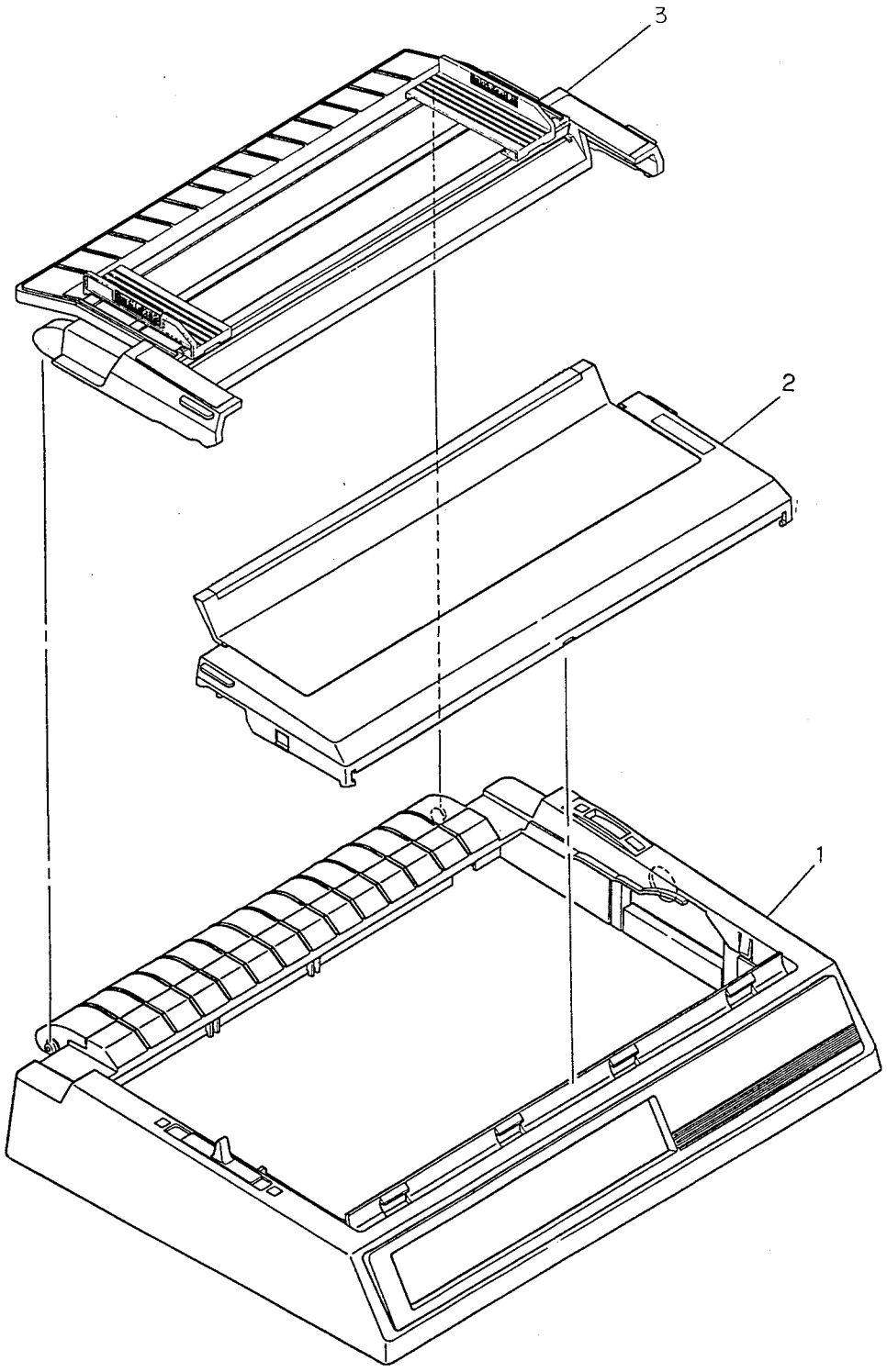


Figure 10-14 Power Supply circuit diagram (220/240V)

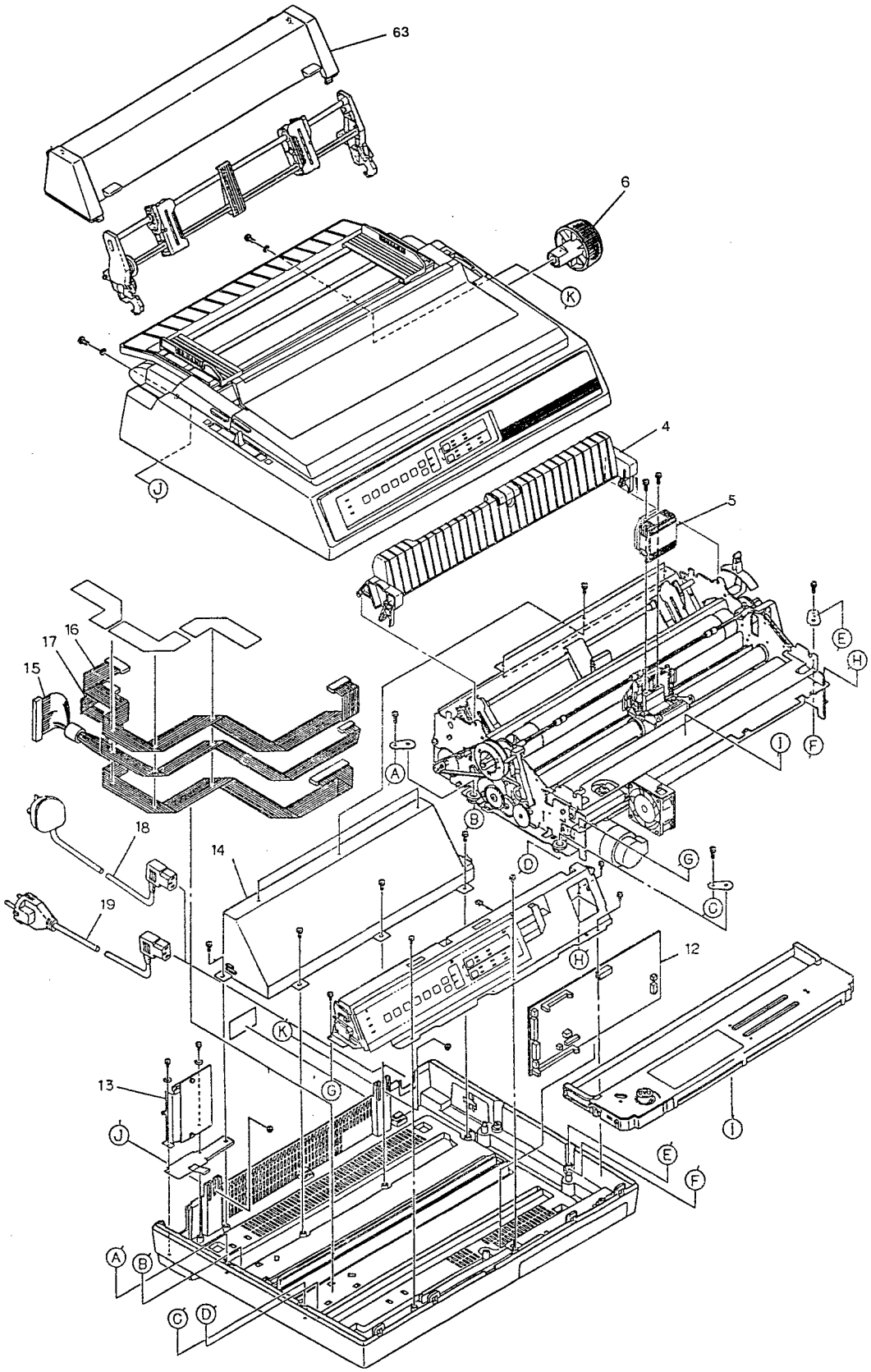
D. SPARE PARTS LIST

Quantity per year: Indicates the recommended number of each part that should be ordered for routine maintenance for one year depending on the number of printers and assuming that the printers are operated for 2 hours/day of 600 hours/year. The following codes are used to indicate the number of printers for which maintenance parts are ordered.

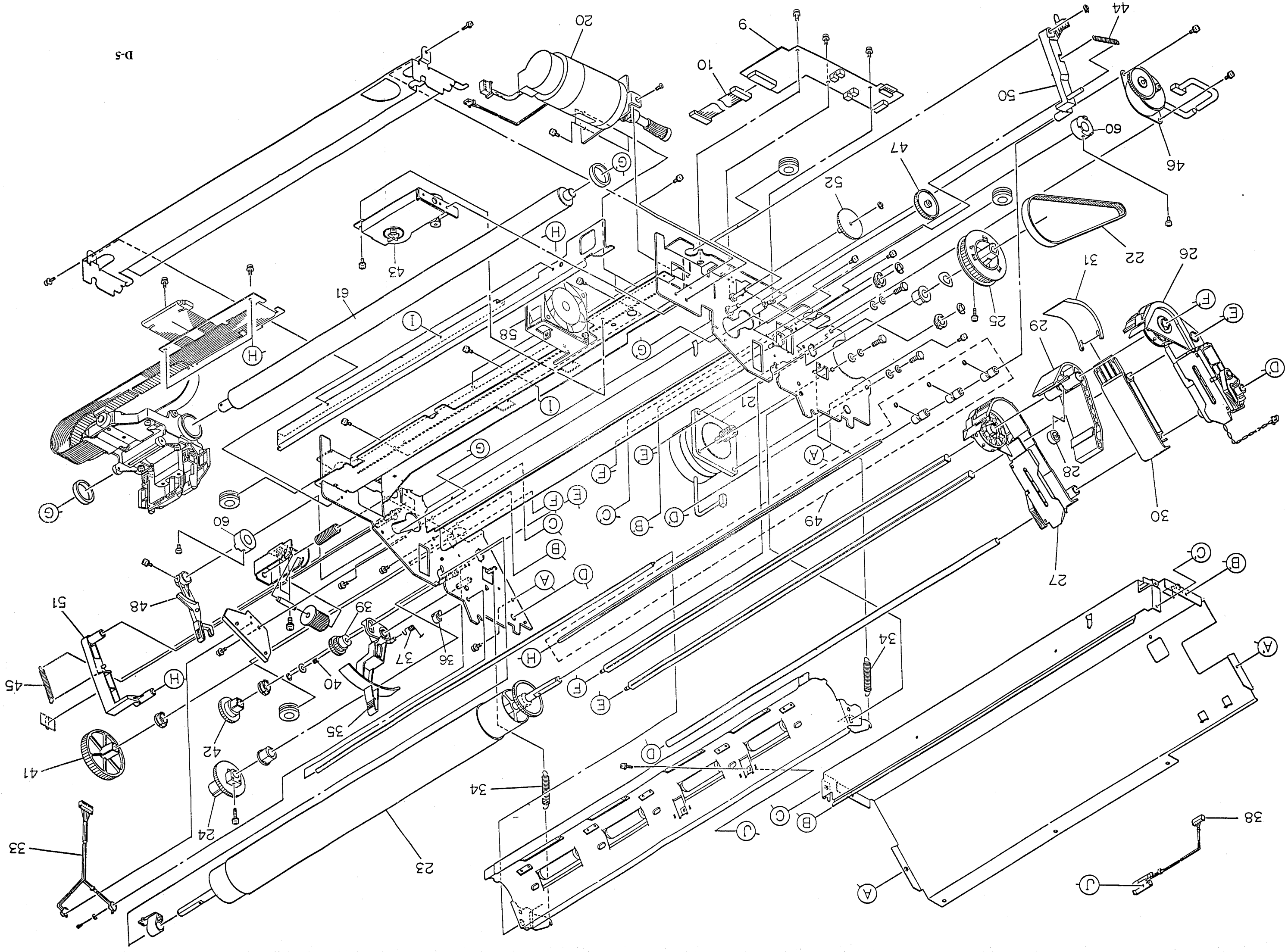
Code	Number of Printers
A	Up to 100
B	Up to 500
C	Up to 1,000



Upper cover assembly



Printer unit general assembly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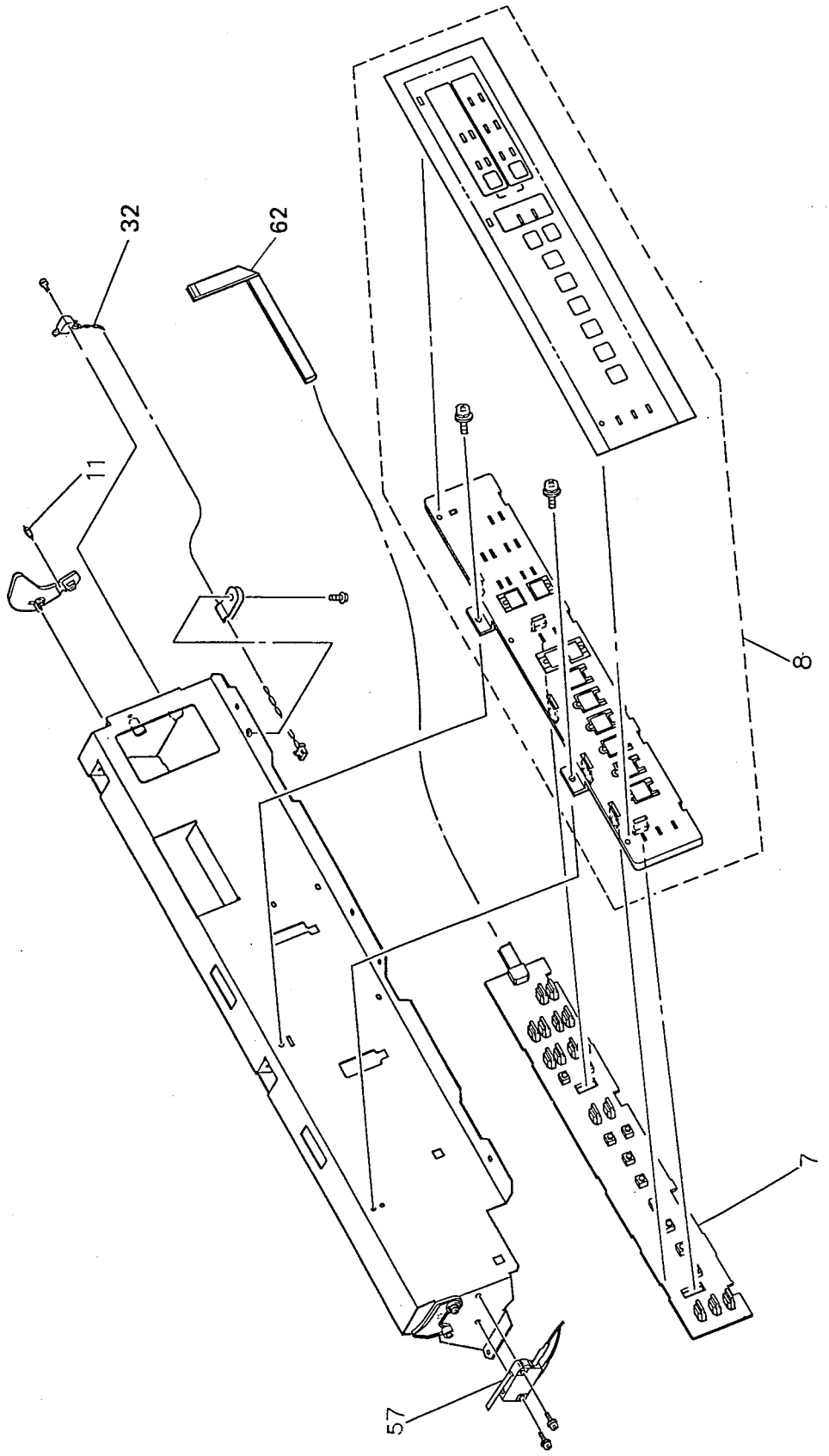
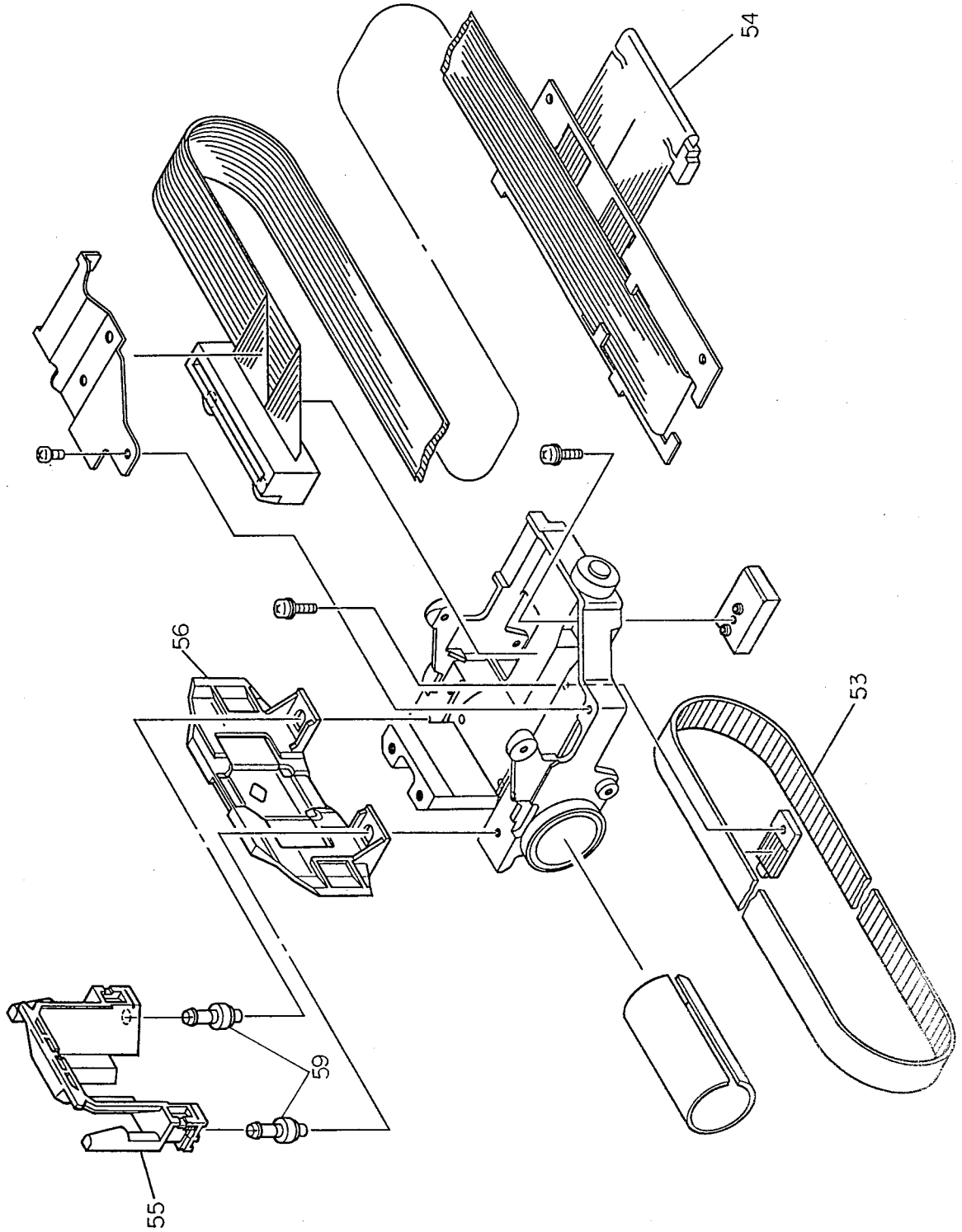
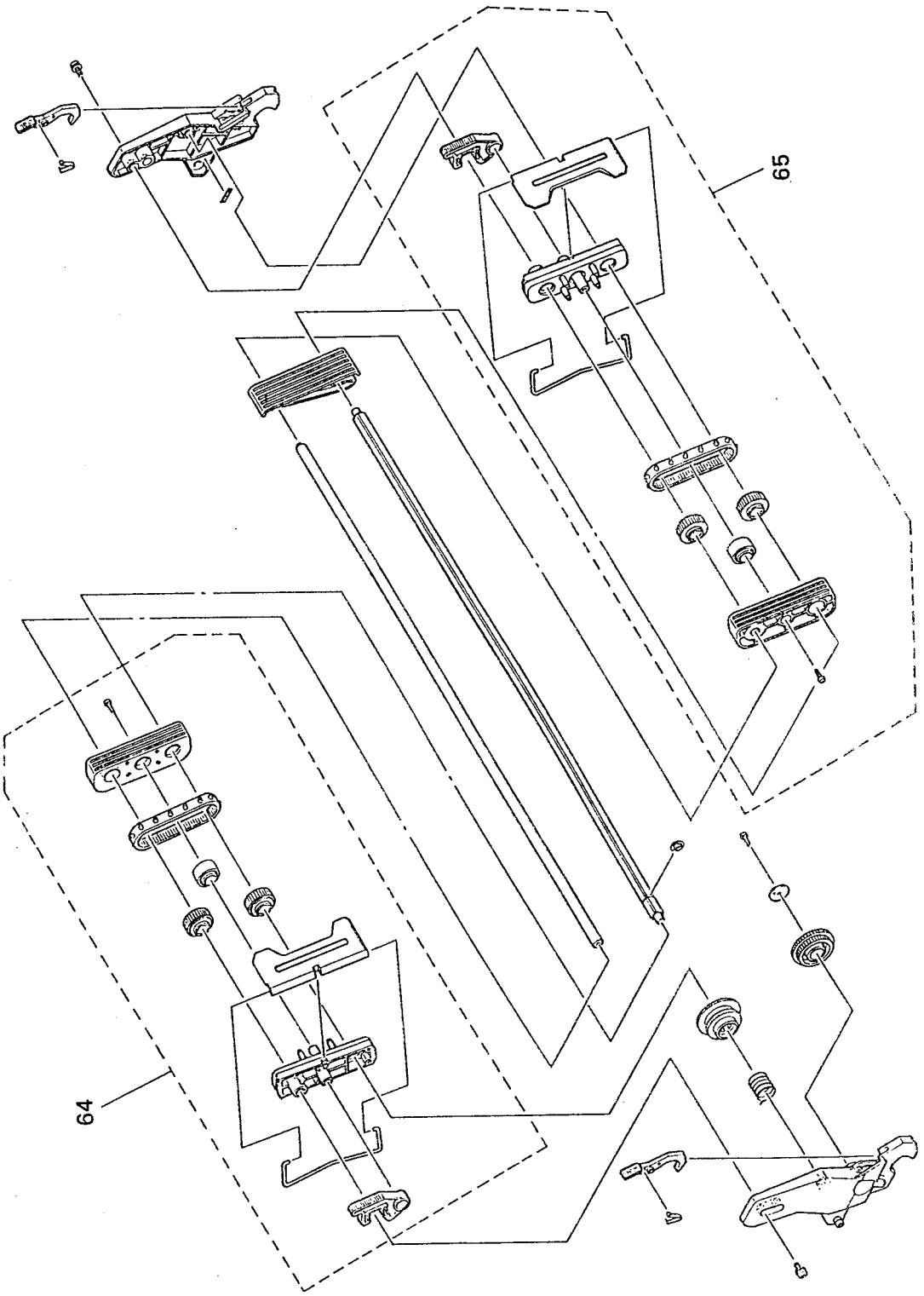


Shield cover assembly



Carriage assembly



Tractor unit

Table of Parts Number 1/3

No.	Parts No.	Description	Q'ty per Printer	Q'ty per year			Remarks
				A	B	C	
1	2PA4016-4723G33	Middle Cover Assy (OEL)	1	1	1	1	
2	1PA4094-5837G2	Access Cover Assy (OEL)	1	1	1	1	
3	1PA4094-5841G2	Rear Cover Assy	1	1	1	1	
4	3PA4043-4278G2	Sheet Separator	1	1	1	2	
5	4YA4023-1501G1	Printhead	1	3	10	20	
6	3PP4043-2501P1	Platen Knob	1	1	1	1	ML393E
7	4YA4042-1511G1	Operation Panel PCB (OPML)	1	1	3	5	
8	3PP4043-4339G1	Operation Panel	1	1	1	1	
9	4YA4042-1512G1	Sensor Board (LPRW)	1	1	1	1	
10	4YS4011-4311P4	Sensor Board Connection Cord	1	1	1	2	
11	4LB-192200-5	Spring (Cover Open Lever)	1	1	1	1	ML393E
12	4YA4042-1509G12	Main PCB (CBNP) without ROM	1	2	6	12	
13	4YA4042-1510G11	Interface Connector Assy (HKTY) (Spare part of IFNP PCB)	1	1	3	5	
14	4YB4049-1278P2	Power Supply Assy (220/240V)	1	3	14	28	
15	3YS4011-7912G1	IF-Main Board Connection Cord (50P)	1	1	1	2	
16	4YS4011-6295G1	Power Connection Cord (9P)	1	1	1	2	ML393E
17	4YS4011-6253G3	Power Connection Cord (13P)	1	1	1	2	ML393E
18	3YS4011-1268P1	AC Cable (U.K.)	1	1	1	1	ML393E
19	3YS4011-1265P1	AC Cable (Continental)	1	1	1	1	
20	3YX4043-2550G4	Space Motor Assy	1	1	3	6	
21	3PB4043-4249P1	LF Motor Assy	1	1	1	1	
22	4LP1313-313	Mini Pitch Belt (LF)	1	1	3	6	
23	3PA4043-2556P1	Platen Assy	1	1	3	6	ML393E
24	3PP4043-2466P1	Platen Gear A	1	1	3	6	ML393E
25	3PP4043-4246P1	Platen Pulley	1	1	3	6	
26	3YX4043-2561G1	Push Tractor Assy (L)	1	1	1	2	ML393E
27	3PA4043-2562G1	Push Tractor Assy (R)	1	1	1	2	ML393E

Table of Parts Number 2/3

No.	Parts No.	Description	Q'ty per Printer	Q'ty per year			Remarks
				A	B	C	
28	4PP4043-2451P1	Friction Piece	1	1	1	1	ML393E
29	3PP4043-2452P1	Center Guide Upper	1	1	1	1	ML393E
30	3PP4043-2453P1	Center Guide Lower A	1	1	1	1	ML393E
31	3PP4043-2454P1	Center Guide Lower B	1	1	1	1	ML393E
32	3YX4043-2751G1	Micro Switch Cable Assy (Cover Open)	1	1	1	2	ML393E
33	3PB4043-4204P1	Micro Switch Cable Assy (Adjust & Release Lever)	1	1	1	2	
34	4LB-193400-1	Spring (Paper Chute)	1	1	1	1	ML393E
35	3PP4043-2459P1	Release Lever	1	1	1	2	ML393E
36	4PP4043-2460P1	Release Lever Guide Block	1	1	1	2	ML393E
37	4PB4043-2754P1	Detent Spring (for Release Lever)	1	1	1	1	ML393E
38	4YX4043-2576G1	Sensor Assy (Cut Sheet)	1	1	1	1	
39	4PP4043-2458P1	Idle Gear	1	1	3	6	ML393E
40	4LB-190600-6	Spring (for Idle Gear)	1	1	1	1	ML393E
41	4PP4043-2456P1	Drive Gear A	1	1	3	6	ML393E
42	4PP4043-2457P1	Drive Gear B	1	1	3	6	ML393E
43	4PA4043-2584G1	Ribbon Feed Assy	1	1	3	6	ML393E
44	4PP4043-2628P1	Spring (Bail Arm) (L)	1	1	1	1	ML393E
45	4LB-193100-2	Spring (Bail Arm) (R)	1	1	1	1	ML393E
46	3PB4043-2601P1	Stepping Motor Assy (Bail Motor)	1	1	1	1	ML393E
47	5LR-193134-1	Idle Gear: Bail Assy	1	1	3	6	ML393E
48	3PP4043-2504P1	Adjust Lever	1	1	1	1	ML393E
49	4PA4043-2711G1	Indicator Shaft Assy	1	1	1	1	ML393E
50	3PP4043-2509P1	Bail Arm (L)	1	1	1	2	ML393E
51	3PP4043-2510P1	Bail Arm (R)	1	1	1	2	ML393E
52	3PP4043-2764P1	Bail Open Cam	1	1	1	2	ML393E
53	4PB4044-1492P3	Mini Pitch Belt (Spacing)	1	2	6	12	ML393E
54	3YX4043-4232G1	Head Cable Assy	1	2	6	12	

Table of Parts Number 3/3

No.	Parts No.	Description	Q'ty per Printer	Q'ty per year			Remarks
				A	B	C	
55	4PP4043-4241G1	Ribbon Guide Assy	1	1	3	6	
56	4PA4043-4235G1	Ribbon Protector Assy	1	2	6	12	
57	3YX4043-4228G1	Interlock Switch Assy	1	1	1	2	
58	4YX4043-4219G1	Cooling Fan	1	1	2	3	
59	4PP4043-4243P1	Ribbon Protector Screw	2	1	1	1	
60	4PP4043-4226P1	Eccentric Collar	2	1	1	1	
61	4PB4043-4348P1	Carriage Shaft	1	1	3	6	
62	4LP-5466-36	Sumi Card	1	1	2	3	
	(Option)						
63	3PA4016-4722G4	Tractor Cover Assy (Option)	1	1	1	1	ML393E
64	4PA4043-2684G1	Tractor Pull (L)		1	1	2	ML393E
65	4PA4043-2685G1	Tractor Pull (R)		1	1	2	ML393E

E. BOTTOM PUSH TRACTOR UNIT (Option)

1. CONFIGURATION

2. INSTALLATION PROCEDURE
   - 2.1 Unpacking
   - 2.2 Installation

3. THEORY OF OPERATION
   - 3.1 Mechanical Operation

4. ASSEMBLY/DISASSEMBLY
   - 4.1 Disassembly/Reassembly of Procedure
   - 4.1.1 Printer Unit
   - 4.1.2 BTFD PCB
   - 4.1.3 Tension Spring
   - 4.1.4 Sheet Guide
   - 4.1.5 Bottom Cover
   - 4.1.6 Drive Pulley and Mini-Pitch Belt
   - 4.1.7 LF Motor
   - 4.1.8 Tractor Assy (L) and (R)
   - 4.1.9 Drive Roller (Pull-up Roller Assy)

5. ADJUSTMENT
   - 5.1 Mini-pitch Belt Tension

6. LUBRICATION

7. TROUBLESHOOTING PROCEDURES

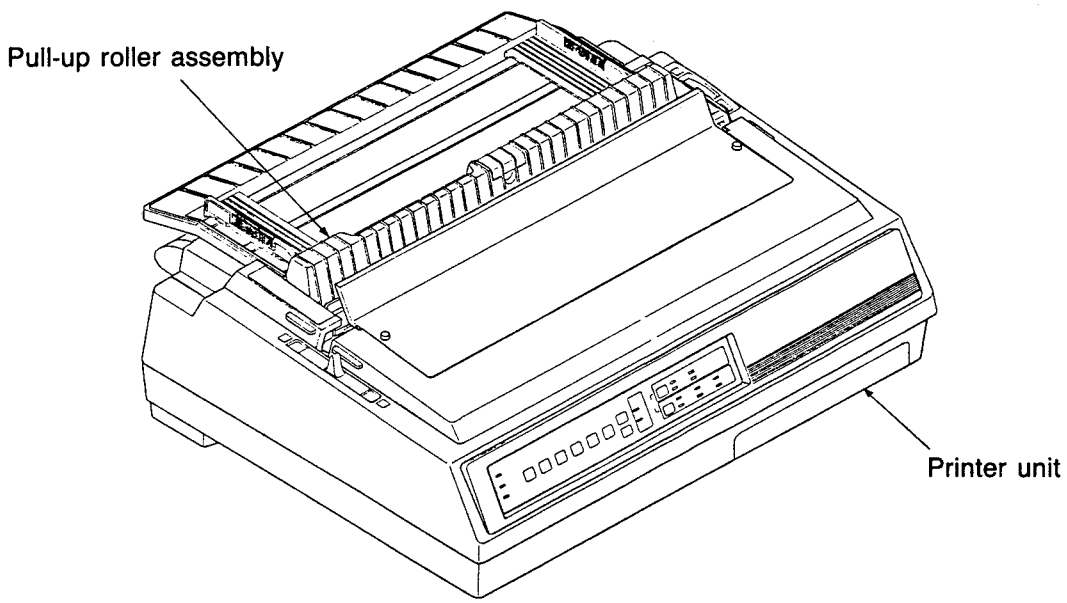
8. CIRCUIT DIAGRAM

9. SPARE PARTS LIST

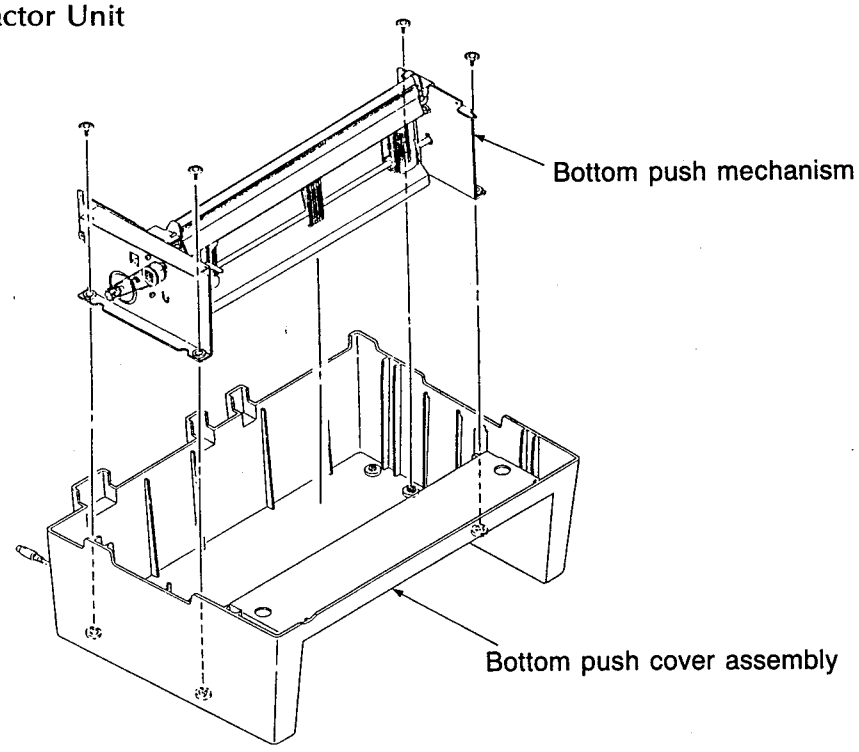
1. CONFIGURATION

The bottom push tractor unit has the following configuration.

- Pull-Up Roller Assembly
  Install the bottom push tractor unit in the printer unit.



- Bottom Push Tractor Unit



2. INSTALLATION PROCEDURE

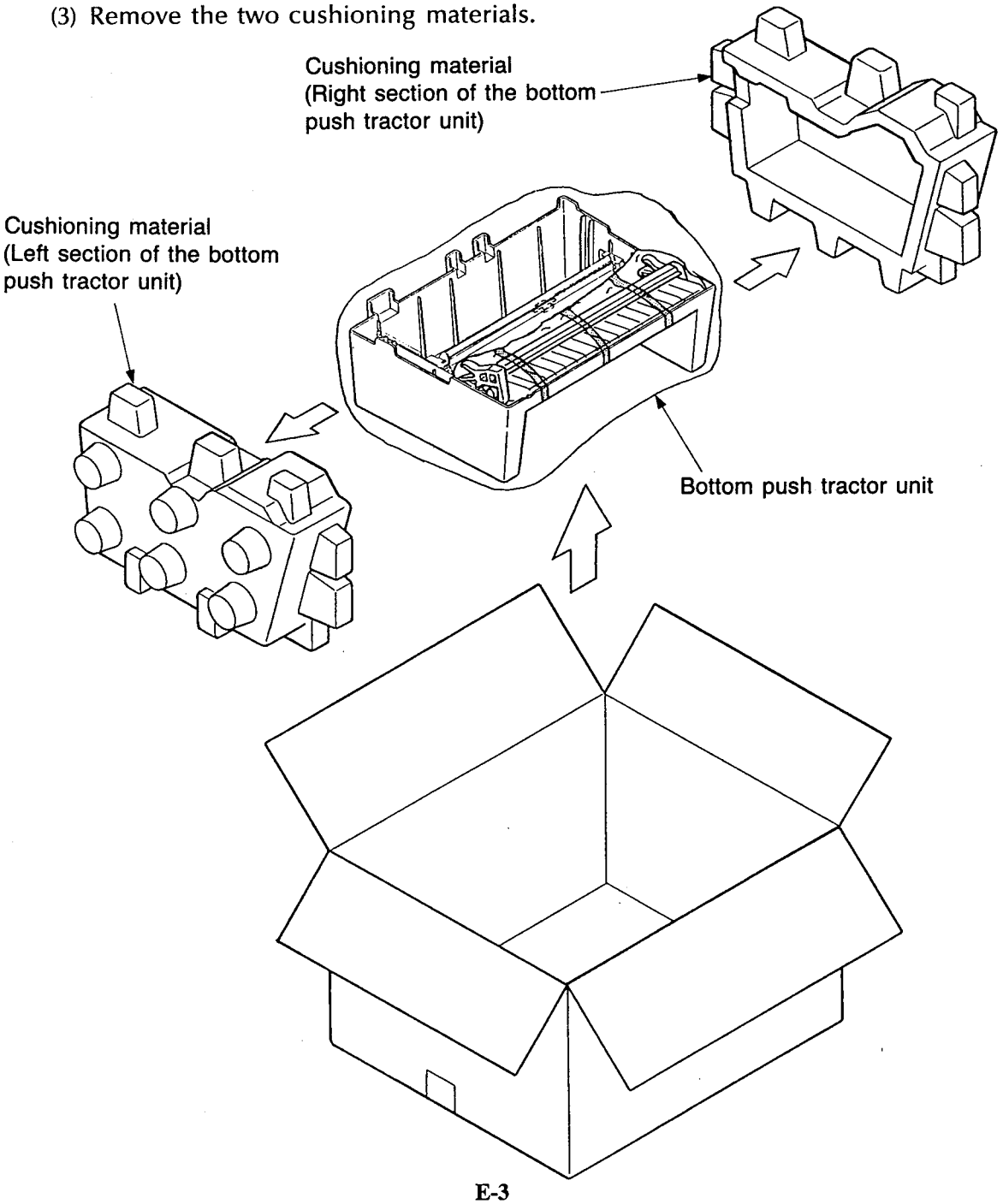
2.1 Unpacking

2.1.1 Unpacking the packing box

(1) Open the packing box.

(2) Remove bottom push tractor unit from the packing box with two cushionings attached.

(3) Remove the two cushioning materials.

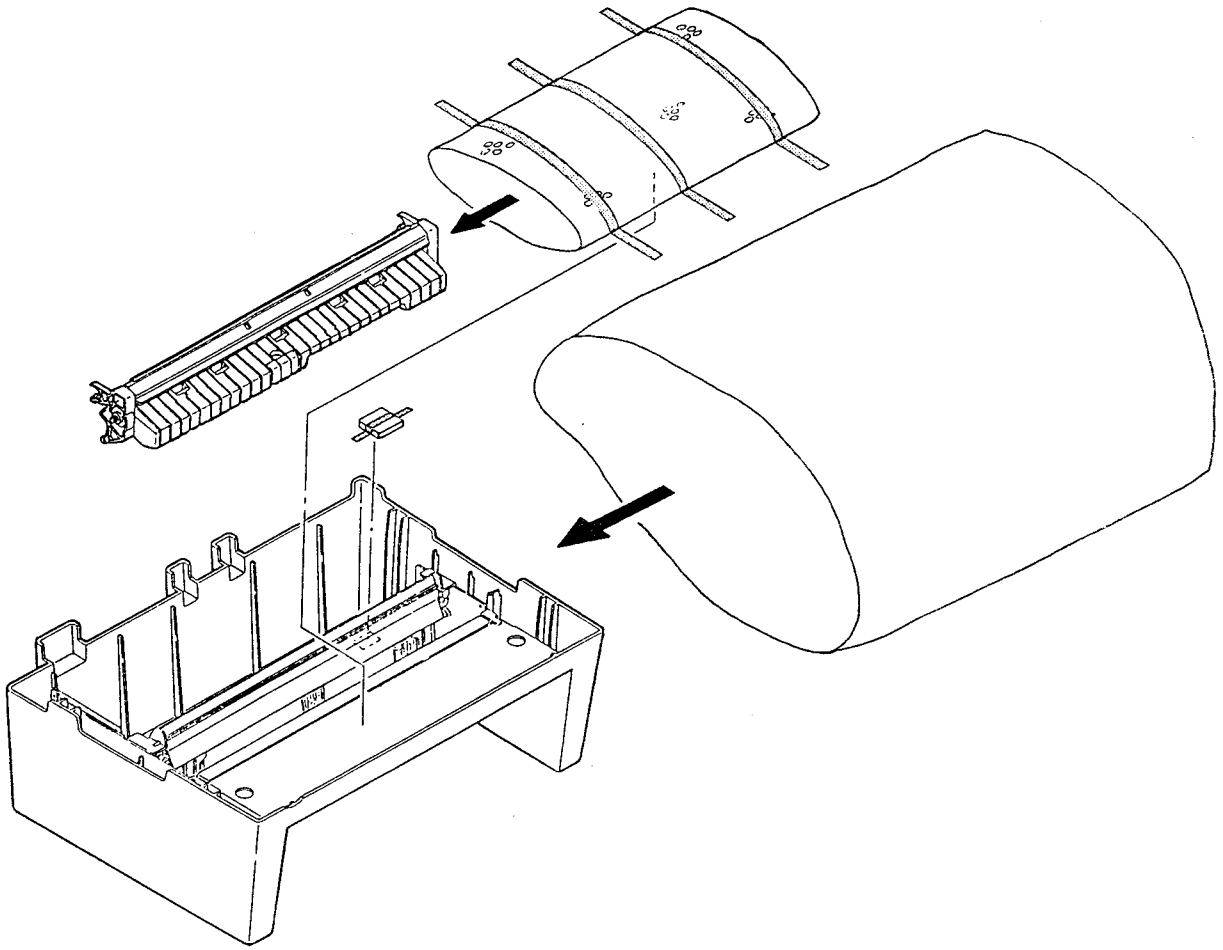


2.1.2 Unpacking the bottom push tractor unit

(1) Remove the bottom push tractor unit from the polyethylene bag.

(2) Take off fixing tape and then remove desiccant and pull-up roller assembly from bottom push tractor unit.

(3) Remove the pull-up roller assembly from the polyethylene bag.



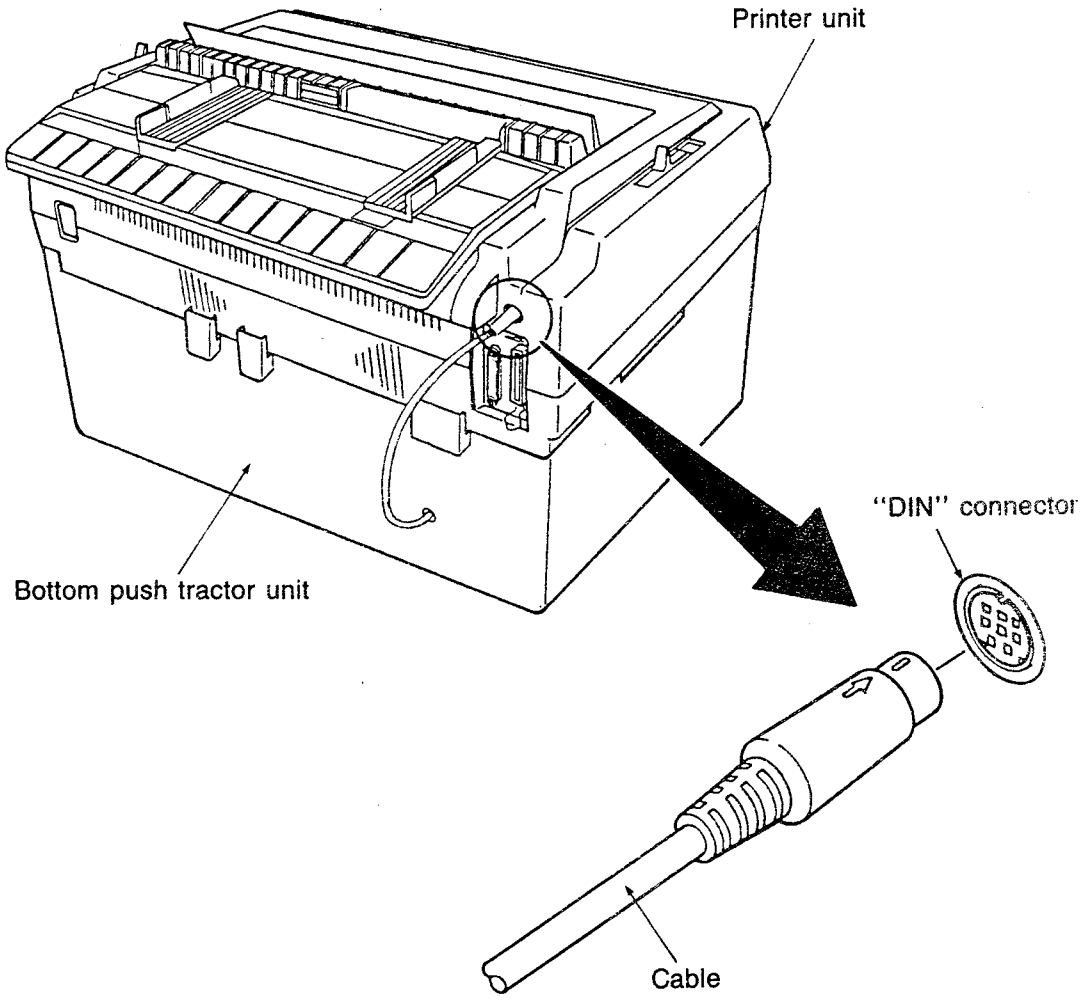
2.2 Installation

2.2.1 Precautions for Installation

See section 2.2.1 for a description of the printer unit.

2.2.2 Installing the Printer Unit

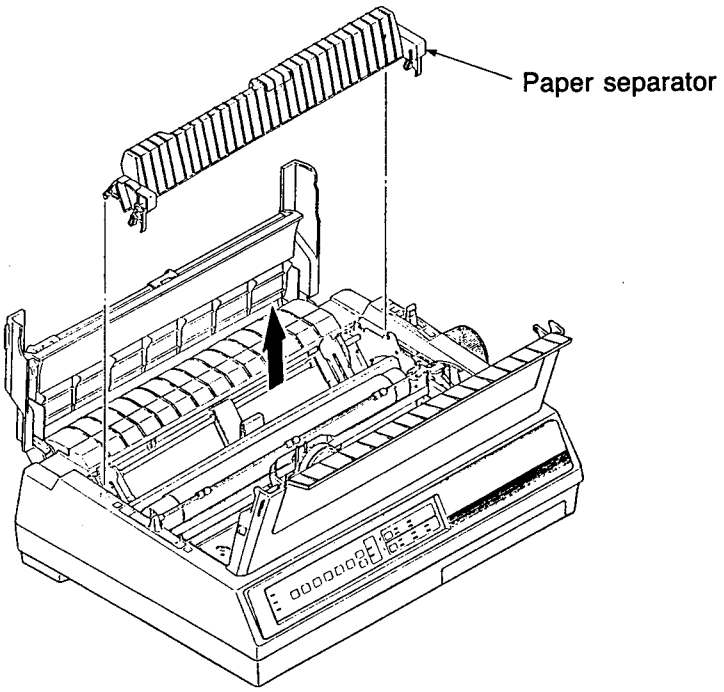
Place the printer unit in the bottom push tractor unit and connect the cable from the bottom push tractor unit to the DIN connector in the rear panel of the printer unit.



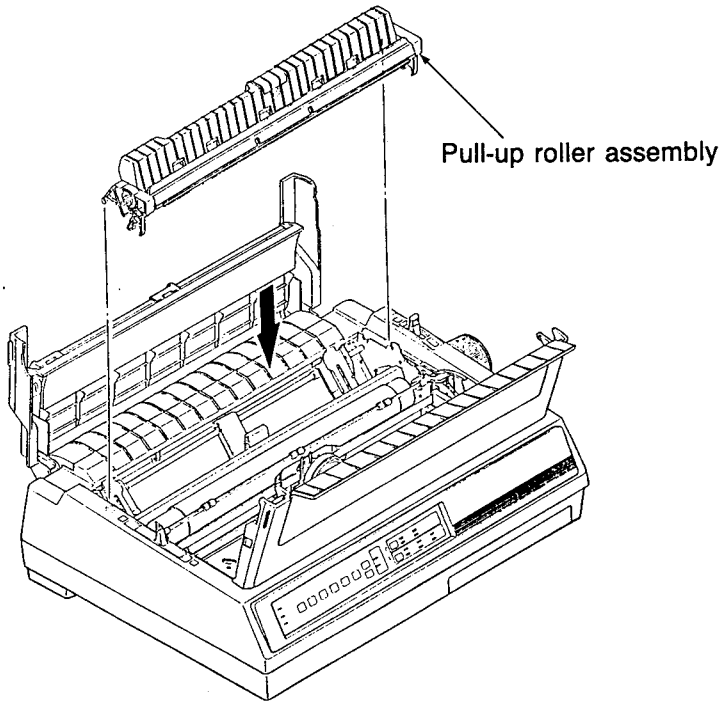
2.2.3 Installing the Pull-Up Roller Assembly

Remove the paper separator of the printer unit and install the pull-up roller assembly.

• Remove the paper separator.

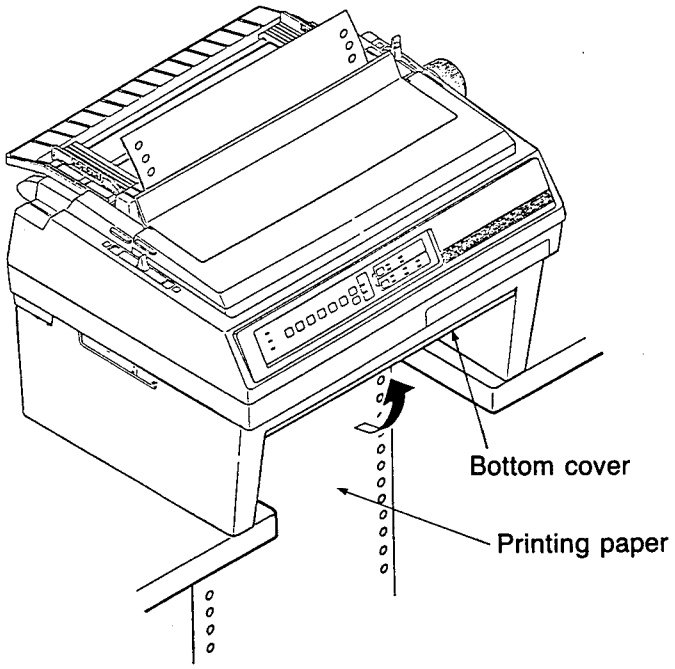


• Install the pull-up roller assembly.

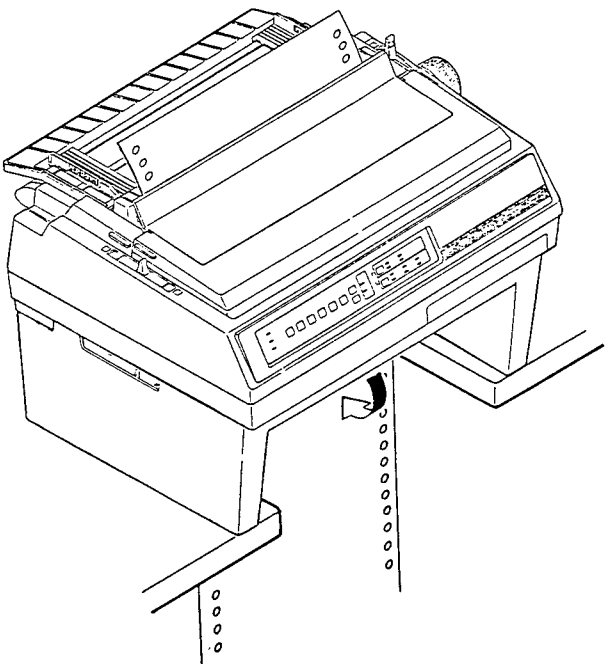


2.2.4 Installing Paper

(1) Open the bottom cover.
(2) Install the printing paper.

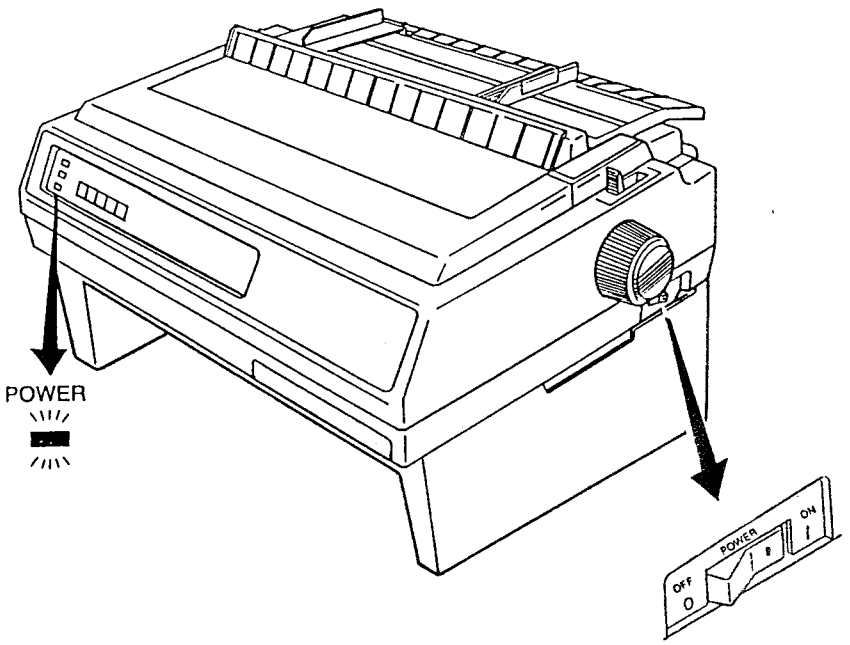


(3) Close the bottom cover.



2.2.5 Powering On

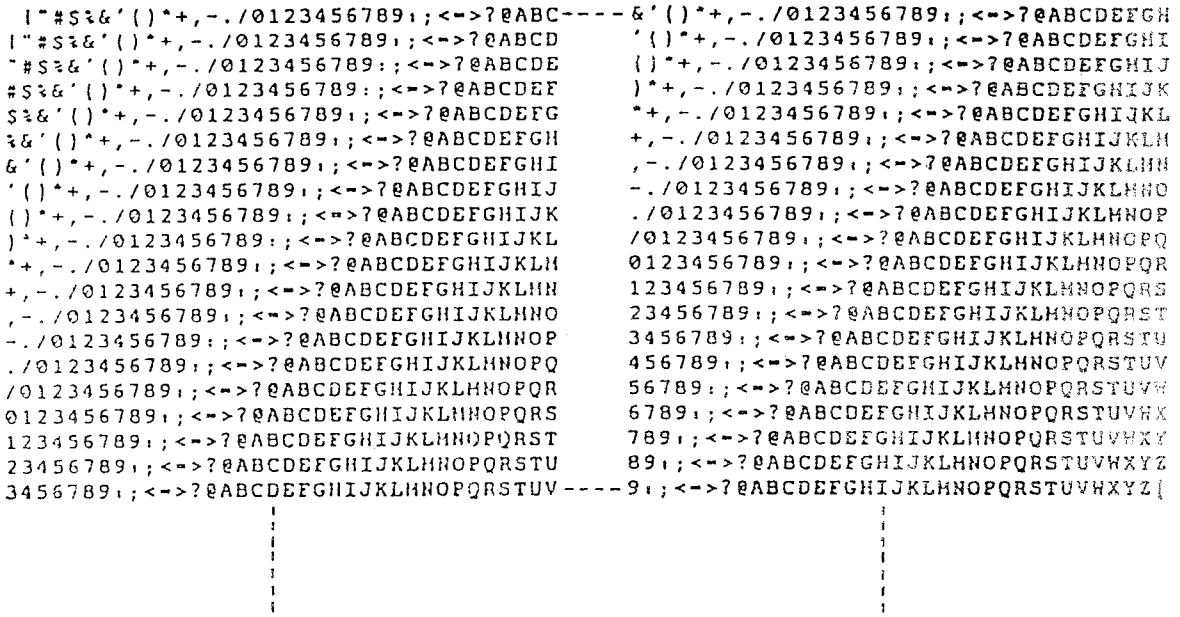
(1) Turn on the POWER switch on the right side of the printer unit.
(2) Confirm that the POWER LED is on and that the printhead returns to its home (left most) position.



(3) If the printer unit shows no abnormality after it is powered on, proceed to the next step for test printing.

(4) Test printing

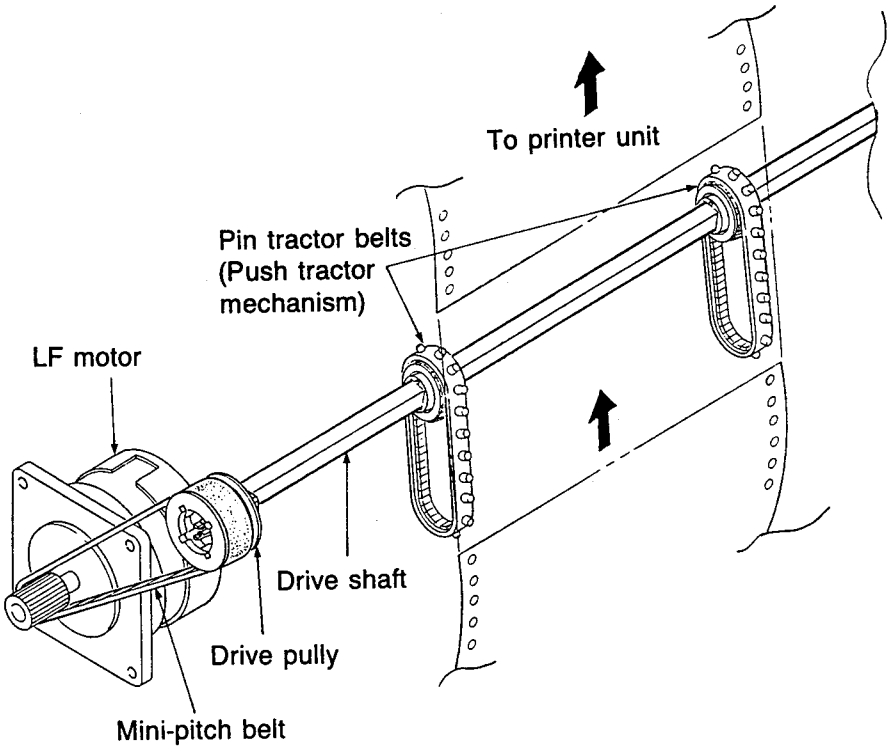
a) After confirming that the POWER switch is off, turn it on while pressing the FORM FEED switch.
b) Confirm that the printer unit prints out the test pattern as shown in the figure below.
c) Press the SELECT switch to end the printing test.
d) Confirm that the SELECT lamp is on, indicating that the printer unit is ready to receive printing data from the host computer.



3. THEORY OF OPERATION

3.1 Mechanical Operation

- The bottom push tractor is driven by the LF-motor (pulse motor) in the bottom push tractor. Motor power is relayed to the drive shaft via the mini-pitch belt and this shaft feeds the paper to the printer unit.



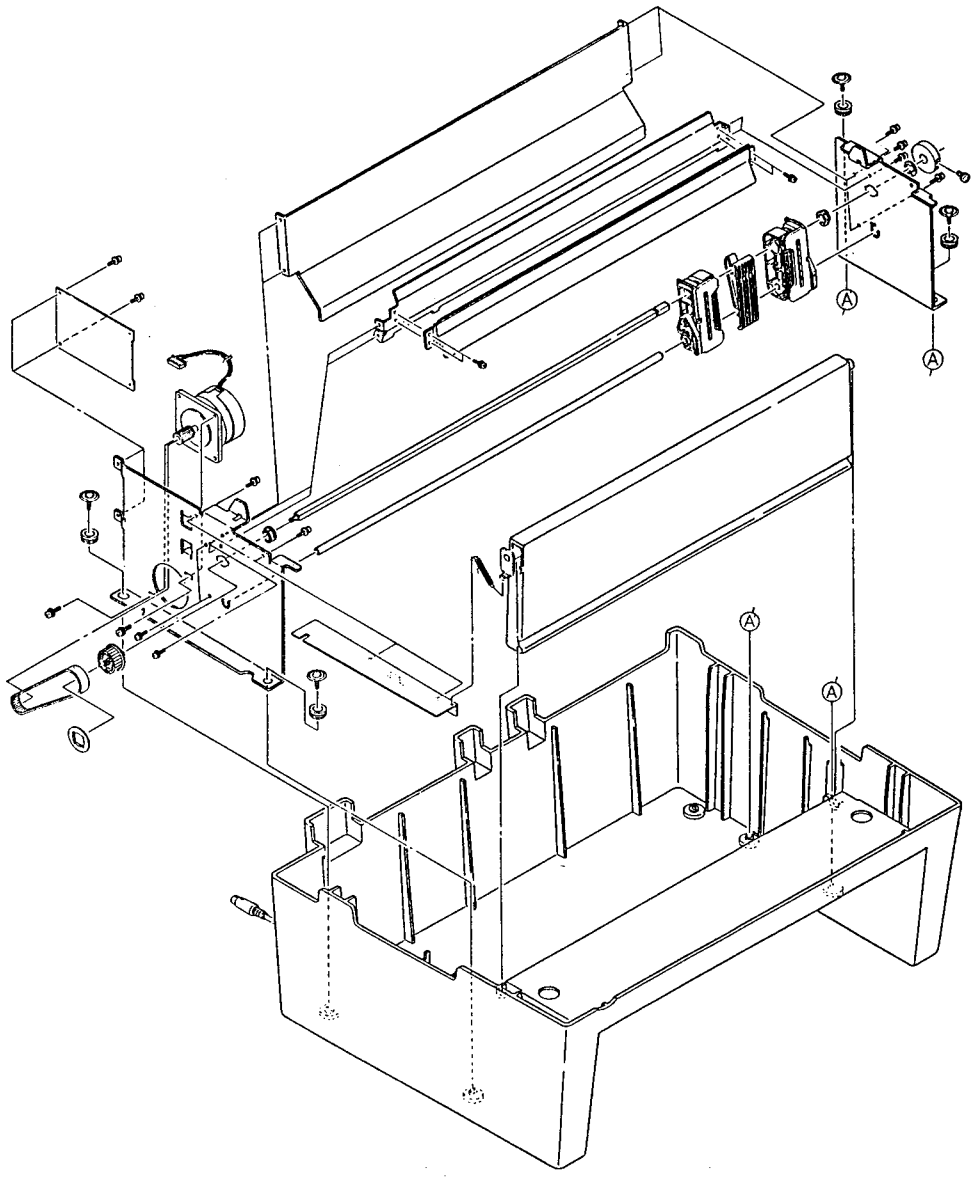
4. ASSEMBLY/DISASSEMBLY

Precautions to be taken while replacing parts and a list of maintenance tools are given in sections "Printer unit" 4.1 and 4.2, respectively.

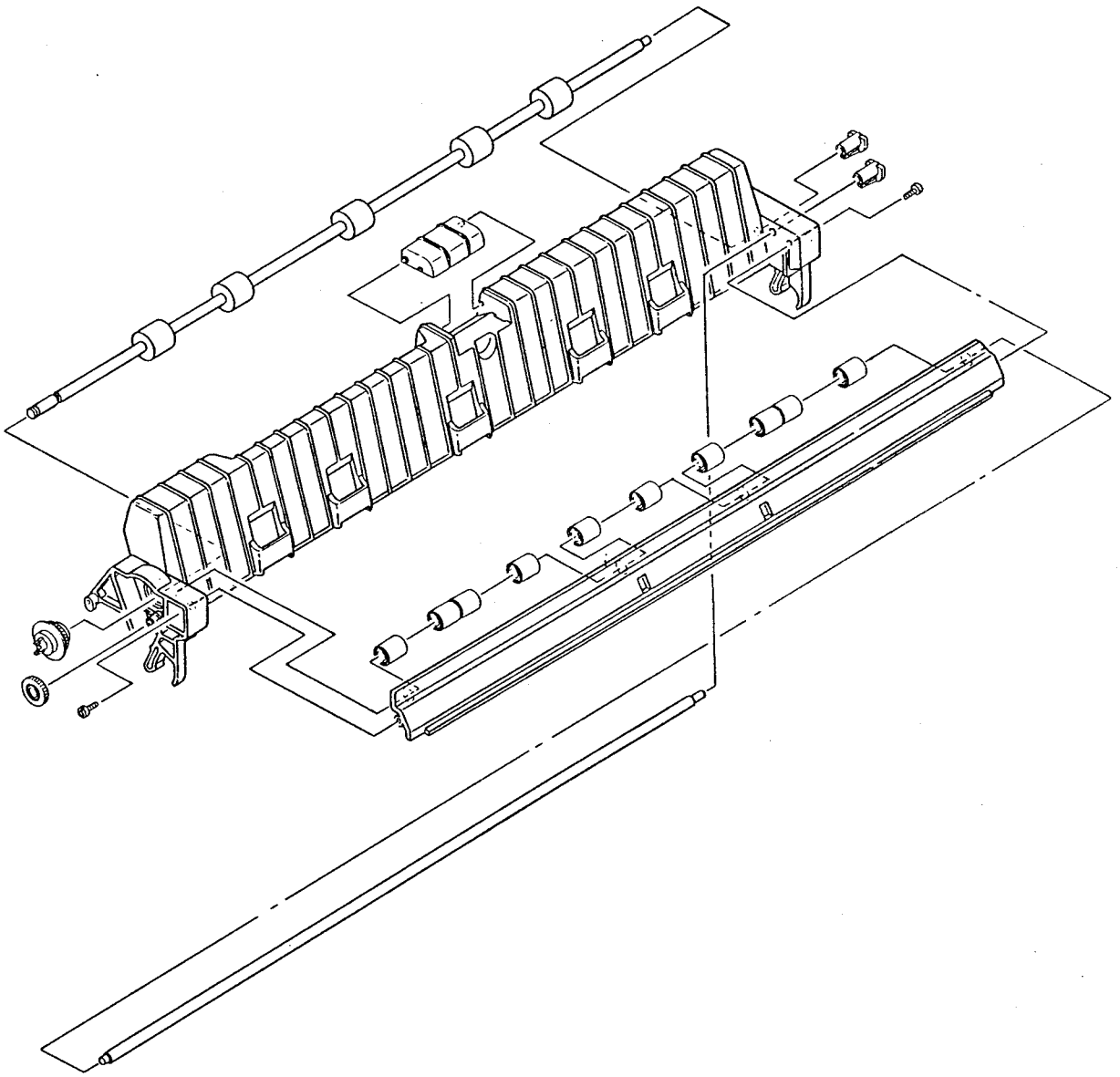
4.1 Disassembly/Reassembly of Procedure

This section explains the disassembly replacement procedures according to the following reassembly.

[Parts Layout]

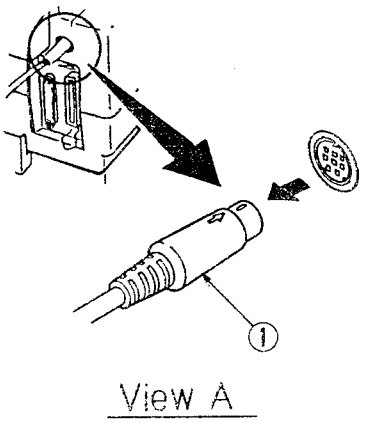


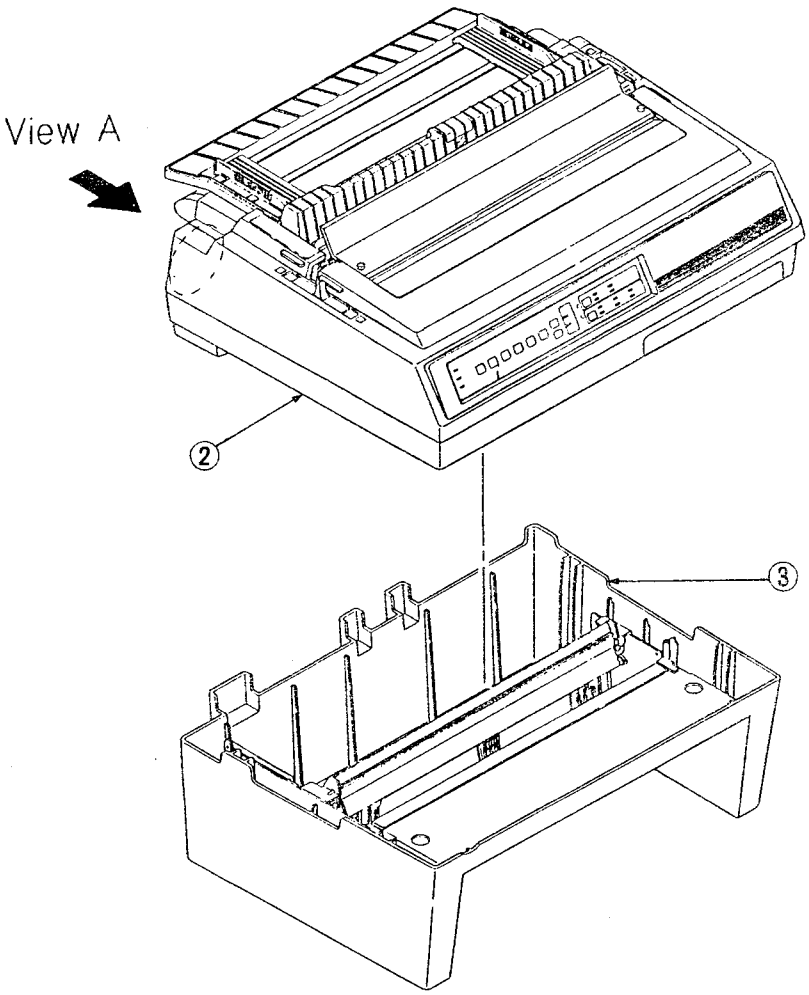
- Pull-Up Roller Assembly



4.1.1 Printer Unit

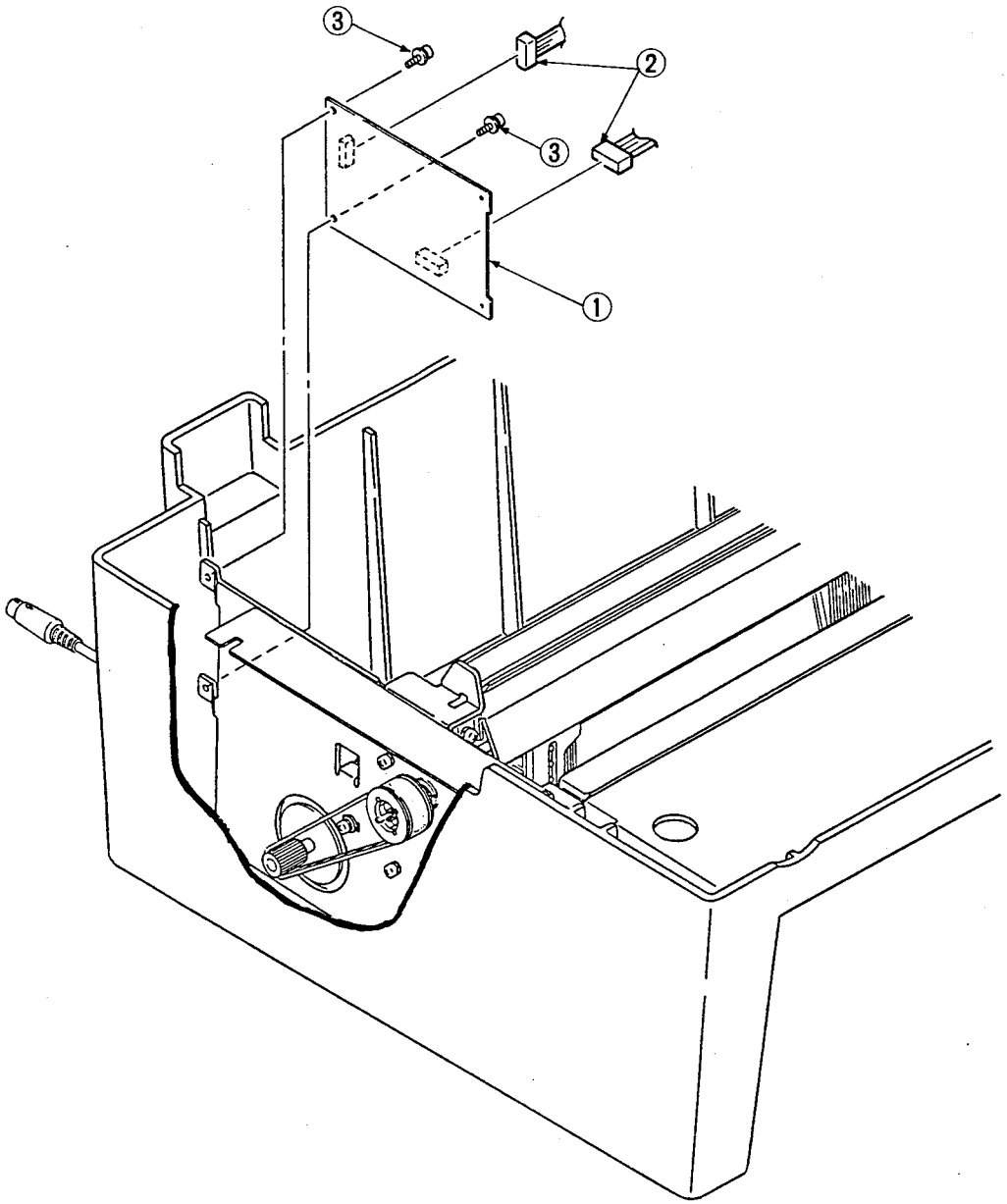
(1) Turn the power switch off and unplug the AC power cord from the outlet.
(2) Remove the DIN connector ① and lift the printer unit ② out of the bottom push tractor ③.





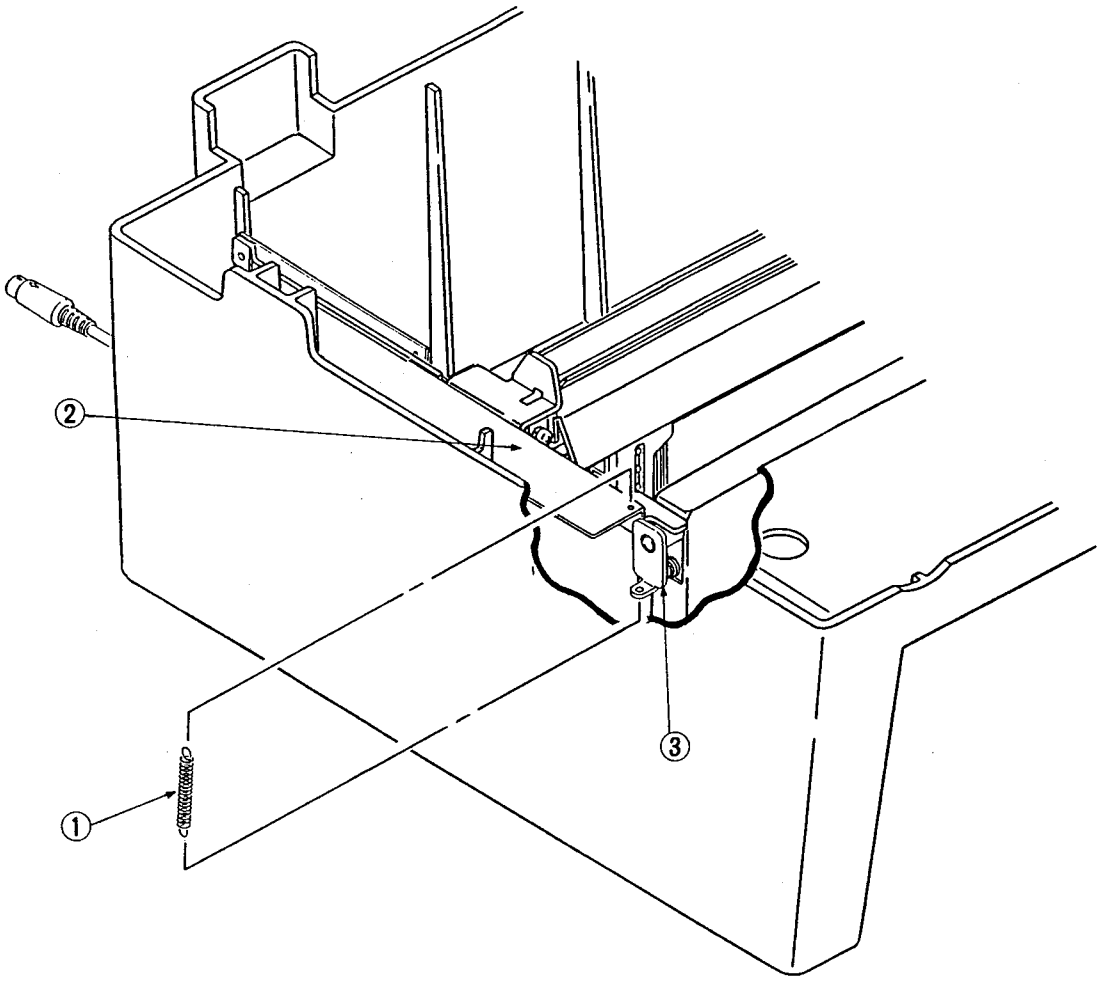
4.1.2 BTFD PCB

(1) Remove the printer unit. (See 4.1.1)
(2) Disconnect the two cables ② connected to CN1 and CN2 of the BTFD board ①.
(3) Remove the two screws ③ and the BTFD board ①.



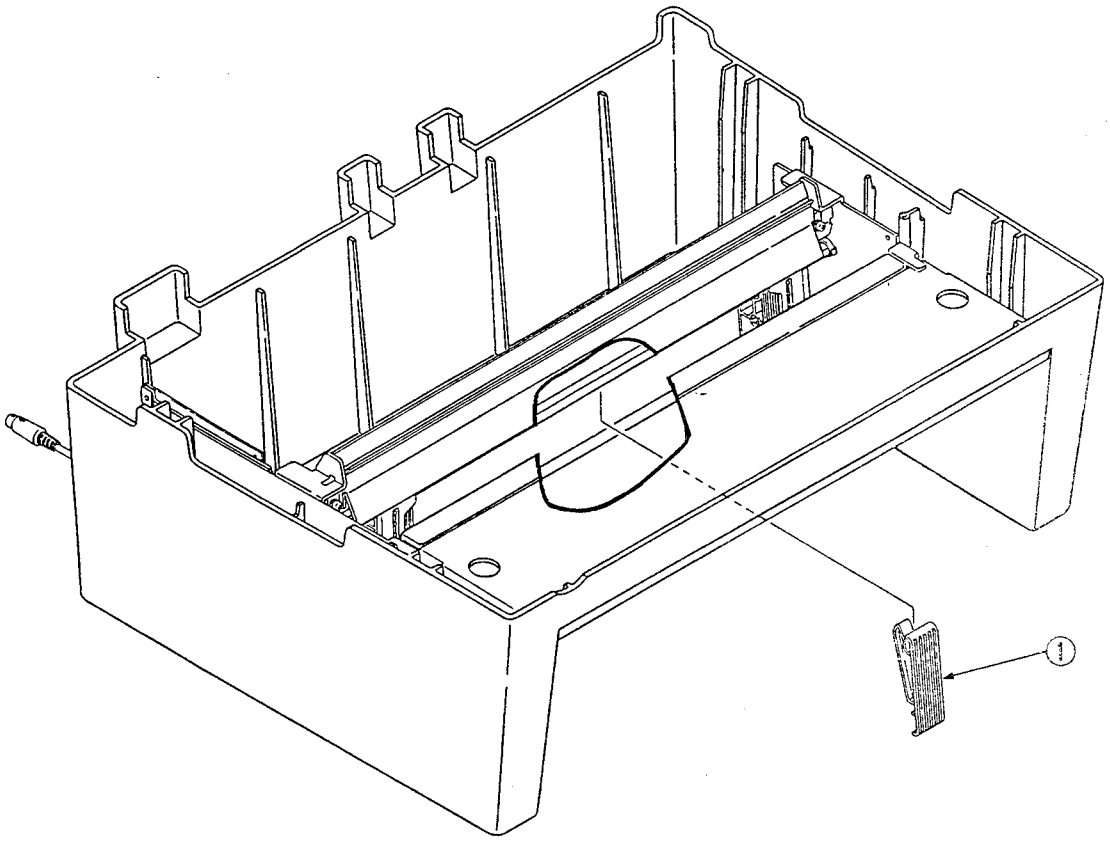
4.1.3 Tension Spring

(1) Remove the printer unit. (See 4.1.1)
(2) Remove the junction between the tension spring ① and blind plate ② and remove the junction between the bottom cover ③ and the tension spring ①.



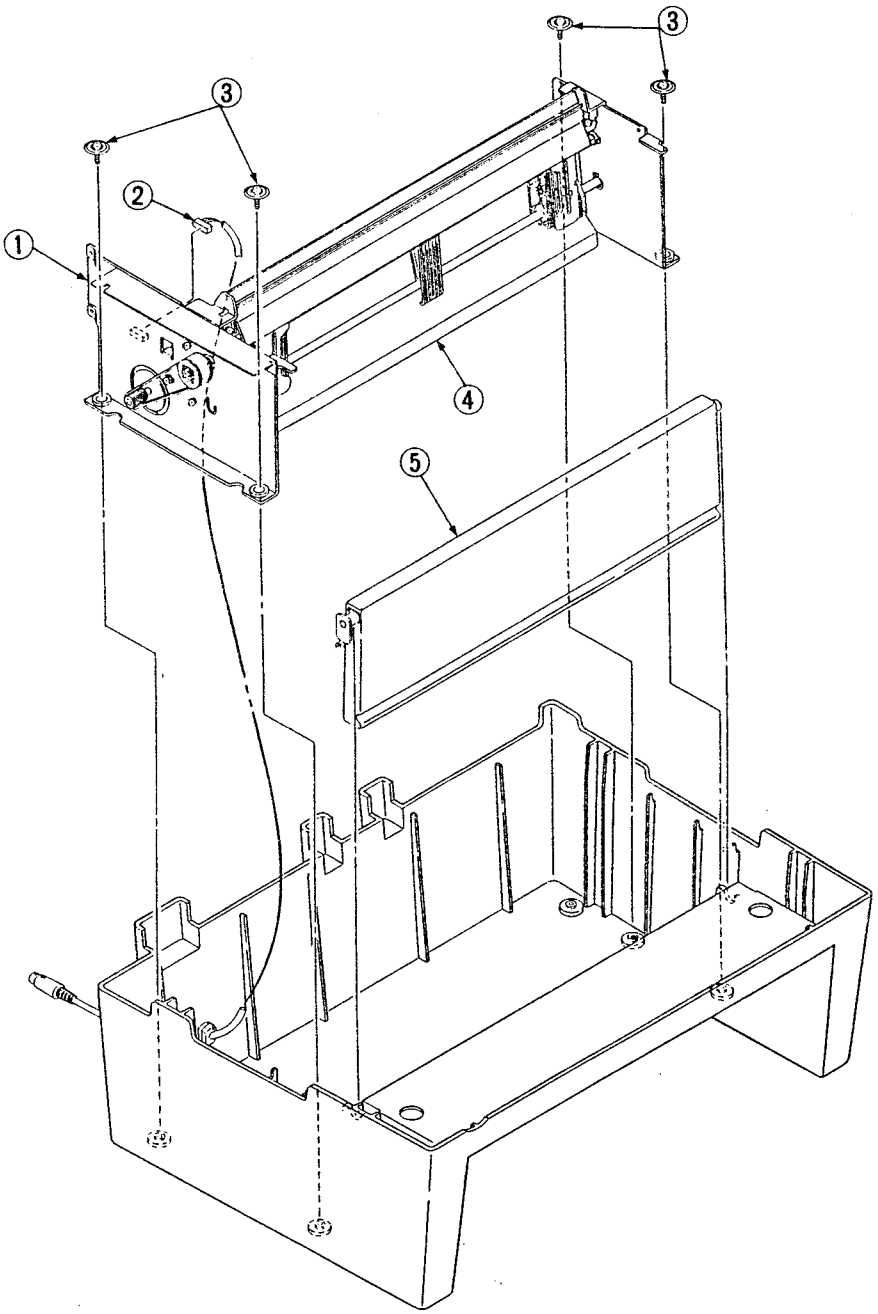
4.1.4 Sheet Guide

(1) Remove the printer unit. (See 4.1.1.)
(2) Remove the lock and the sheet guide ①.



4.1.5 Bottom Cover

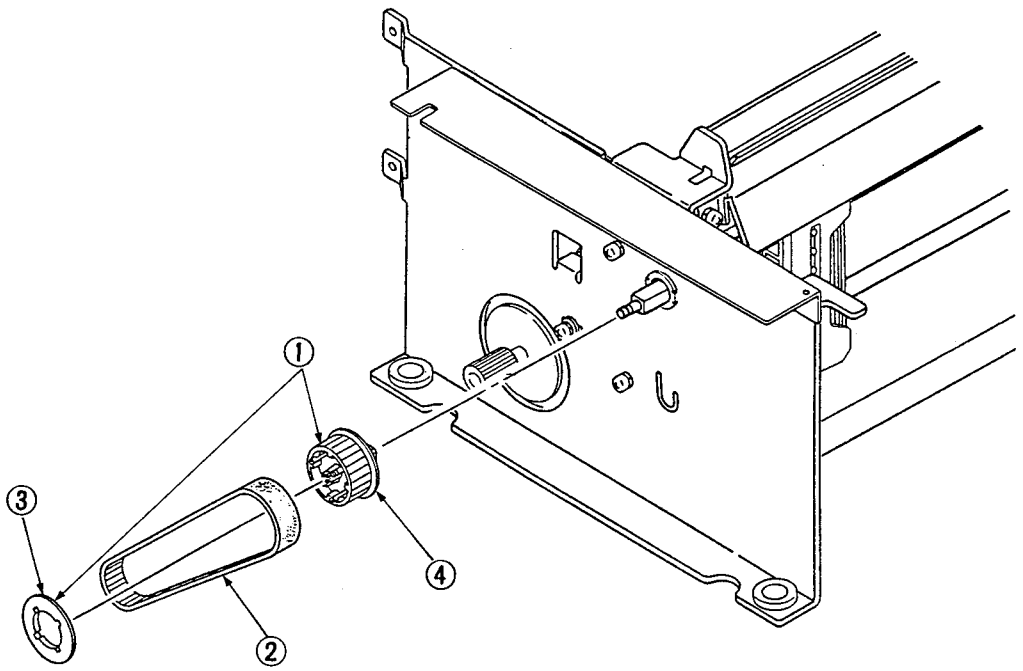
(1) Remove the printer unit. (See 4.1.1.)
(2) Remove the CN1 connecting cable ② in the BTFD board ①.
(3) Remove the Tension Spring. (See 4.1.3.)
(4) Remove the four screws ③ and the bottom push mechanism.
(5) Remove the bottom cover ⑤.



4.1.6 Drive Pully and Mini-pitch Belt

(1) Remove the printer unit. (See 4.3.21.)
(2) Remove the bottom push mechanism. (See steps (2), (3), (4) in 4.1.5)
(3) Release the lock, then remove the flange ③ of the drive pulley ① .
(4) Remove the mini-pitch belt ② .
(5) Remove the pulley ④ of the drive pulley ① .

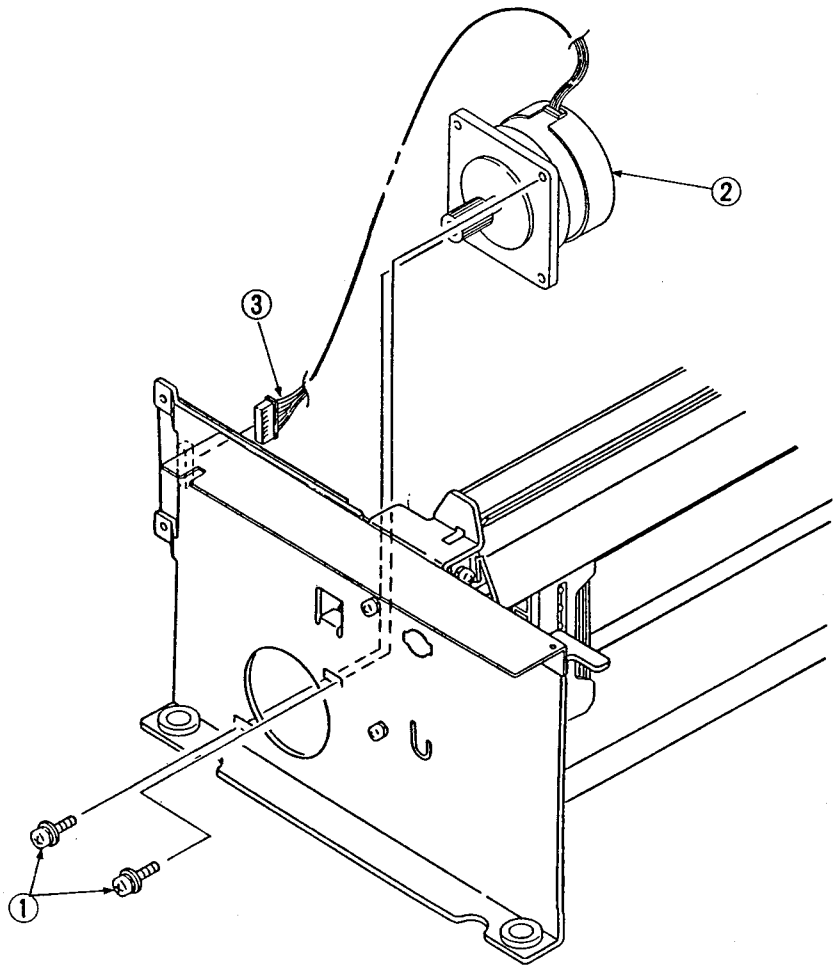
Note: *When removing the mini-pitch belt only, it is necessary to remove the flange ③ only.*



4.1.7 LF Motor

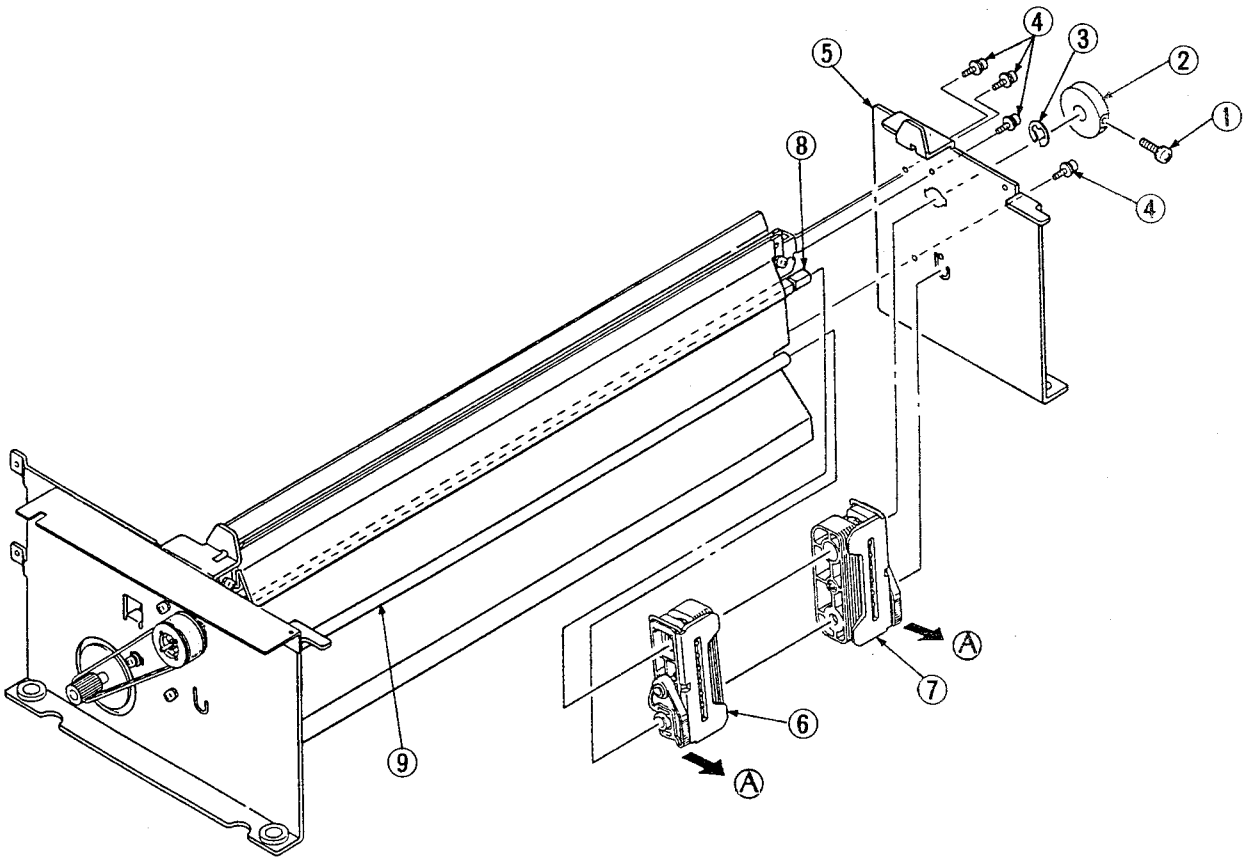
(1) Remove the printer unit. (See 4.1.1.)
(2) Remove the bottom push mechanism. (See steps (2), (3), (4) in 4.1.5.)
(3) Remove the CN2 connecting cable ③ in the BTFD Board.
(4) Remove the two screws ① and the LF motor ②.

[Installation]
Adjust the tension of the mini-pitch belt when the LF motor is installed. (See 5.1.)



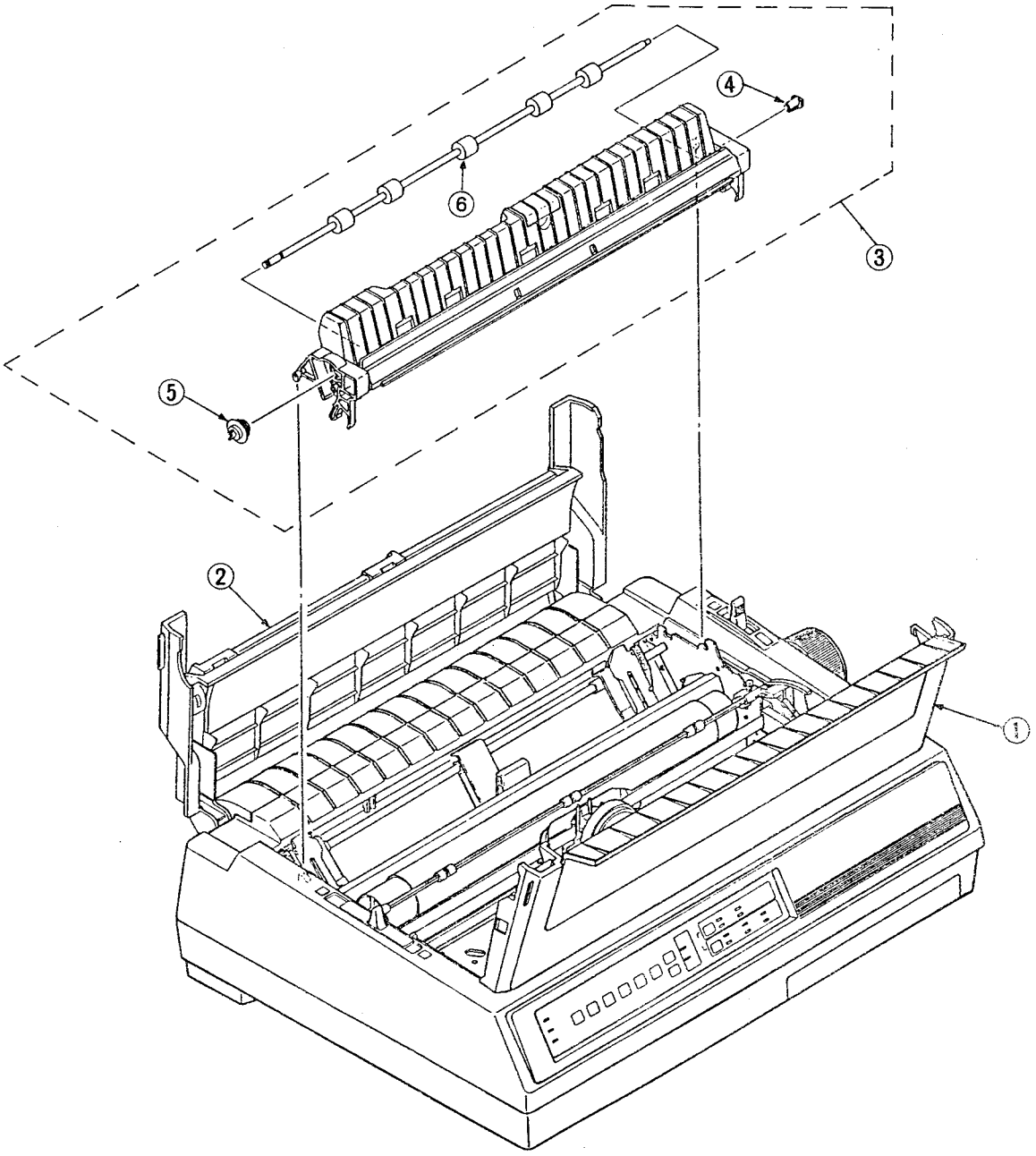
4.1.8 Tractor Assembly (L) and (R)

(1) Remove the printer unit. (See 4.1.1.)
(2) Remove the bottom push mechanism. (See steps (2), (3), (4) in 4.1.5.)
(3) Remove the one screw ①, the balancer ②, the E-clip ③, the four screws ④ and the side frame (R) ⑤.
(4) Pull the lock lever of the tractor assembly (L) ⑥ and (R) ⑦ towards you in the direction of the arrow A .
(5) Remove the tractor assembly (L) ⑥ and (R) ⑦ from the drive shaft ⑧ and the lock shaft ⑨ .



4.1.9 Drive Roller (Pull-up Roller Assy)

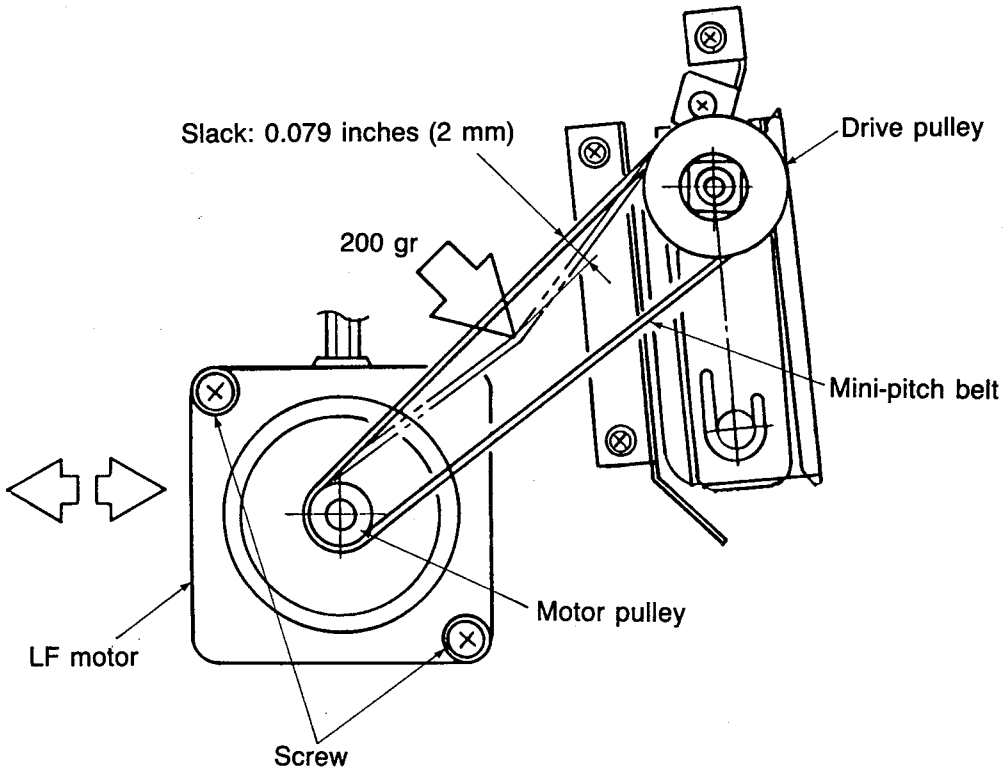
(1) Open the access cover assembly ① and rear cover assembly ② and, lifting the pull-up roller assembly ③ remove it from the printer unit.
(2) Remove the bush ④, the Drive gear ⑤ and the Drive roller ⑥.



5. ADJUSTMENT

5.1 Mini-pitch Belt Tension

Standard:	The slack of the belt should be 0.079 inches (2 mm) when a force equivalent to 200 g is applied to the middle of the belt.
Place of inspection:	Check belt slack at the center of the belt between the motor pulley and the drive pulley.
Method of adjustment:	Loosen the two screws that secure the LF motor and move the position of the motor.



6. LUBRICATION

6.1 Lubrication Oil

Pan Motor Oil (or the equivalent) ... PM

6.2 Amount of Oil

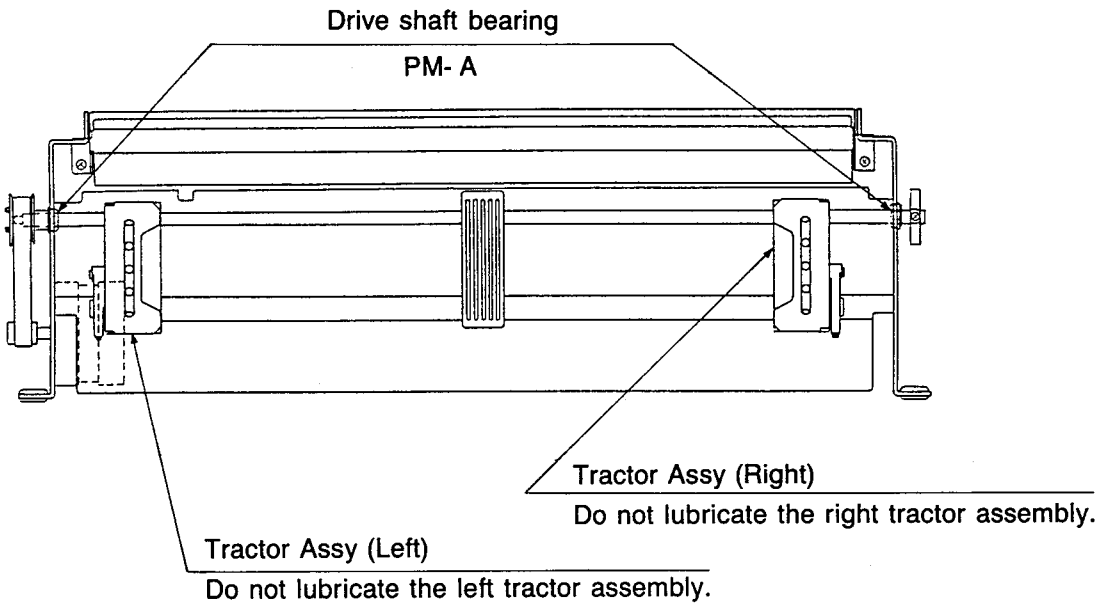
Normally: A 3 to 4 drops

6.3 The following parts must not be lubricated.

Parts not to be lubricated	Reason	Remarks
Right and left tractor assemblies	To prevent soiling of printing paper	

Do not lubricate other parts that may also soil the printing paper.

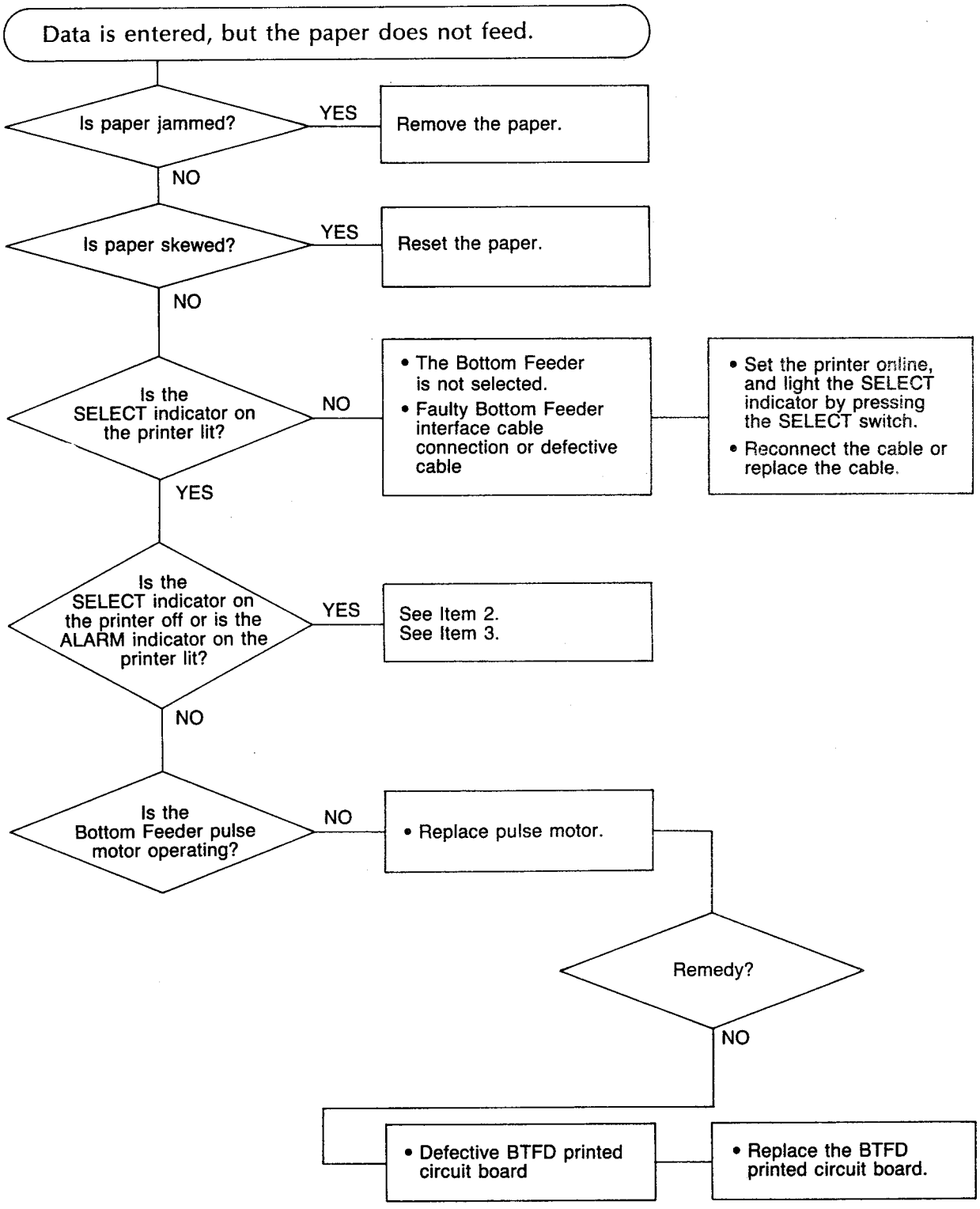
6.4 Lubrication


Drive shaft bearing
PM- A
Tractor Assy (Right)
Do not lubricate the right tractor assembly.
Tractor Assy (Left)
Do not lubricate the left tractor assembly.

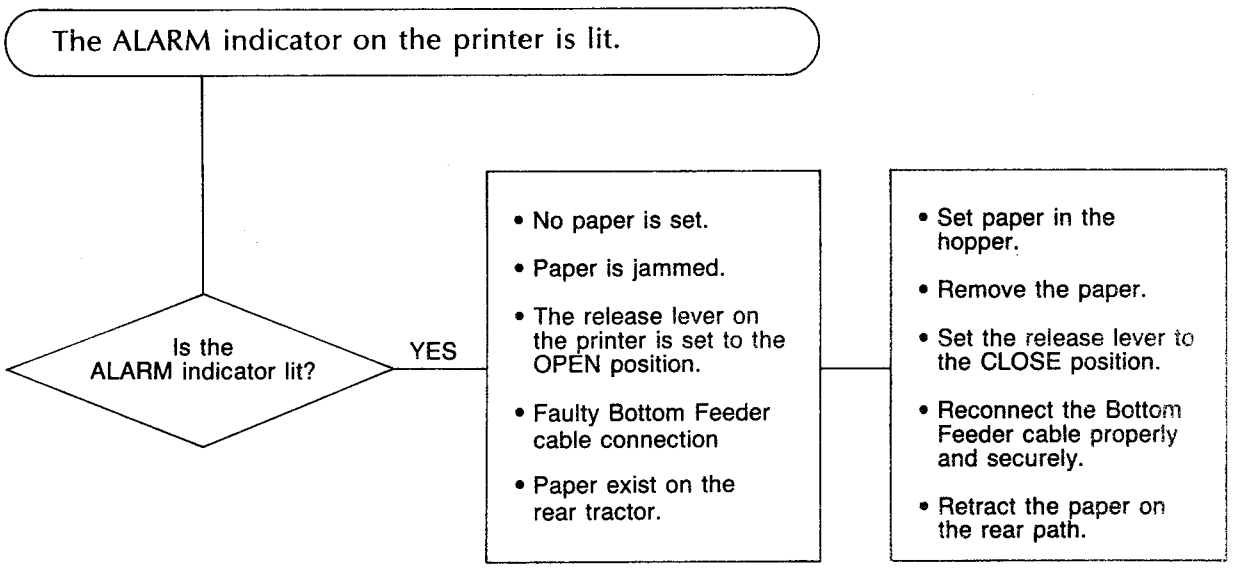
7. TROUBLESHOOTING PROCEDURES

The flow chart given below is a list of troubleshooting procedures that have been used to cope with local malfunctions.

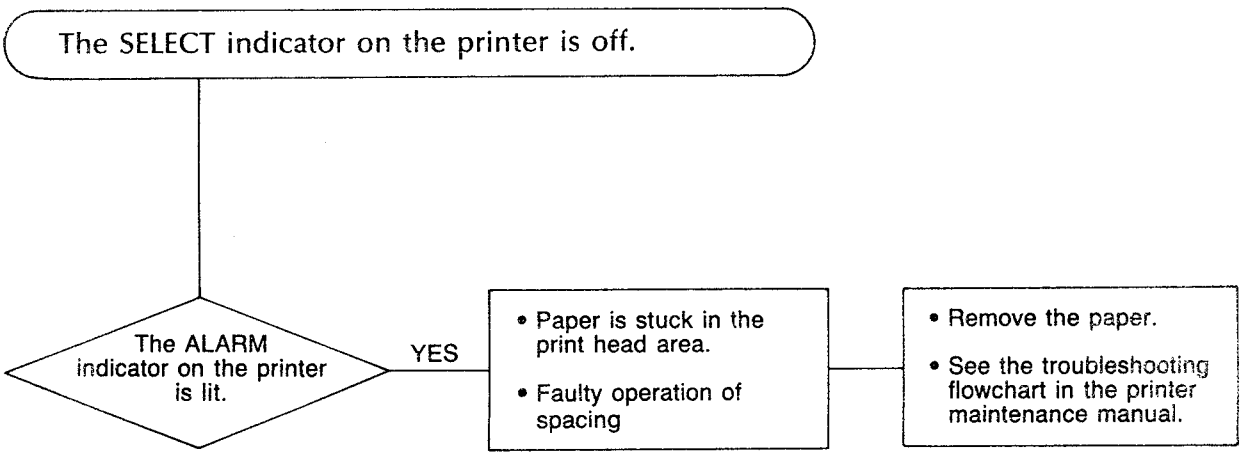
Item 1


Data is entered, but the paper does not feed.
Is paper jammed?
YES
Remove the paper.
NO
Is paper skewed?
YES
Reset the paper.
NO
Is the SELECT indicator on the printer lit?
NO
• The Bottom Feeder is not selected.
• Faulty Bottom Feeder interface cable connection or defective cable
• Set the printer online, and light the SELECT indicator by pressing the SELECT switch.
• Reconnect the cable or replace the cable.
YES
Is the SELECT indicator on the printer off or is the ALARM indicator on the printer lit?
YES
See Item 2.
See Item 3.
NO
Is the Bottom Feeder pulse motor operating?
NO
• Replace pulse motor.
Remedy?
NO
• Defective BTFD printed circuit board
• Replace the BTFD printed circuit board.

Item 2


The ALARM indicator on the printer is lit.
Is the ALARM indicator lit?
YES
• No paper is set.
• Paper is jammed.
• The release lever on the printer is set to the OPEN position.
• Faulty Bottom Feeder cable connection
• Paper exist on the rear tractor.
• Set paper in the hopper.
• Remove the paper.
• Set the release lever to the CLOSE position.
• Reconnect the Bottom Feeder cable properly and securely.
• Retract the paper on the rear path.

Item 3

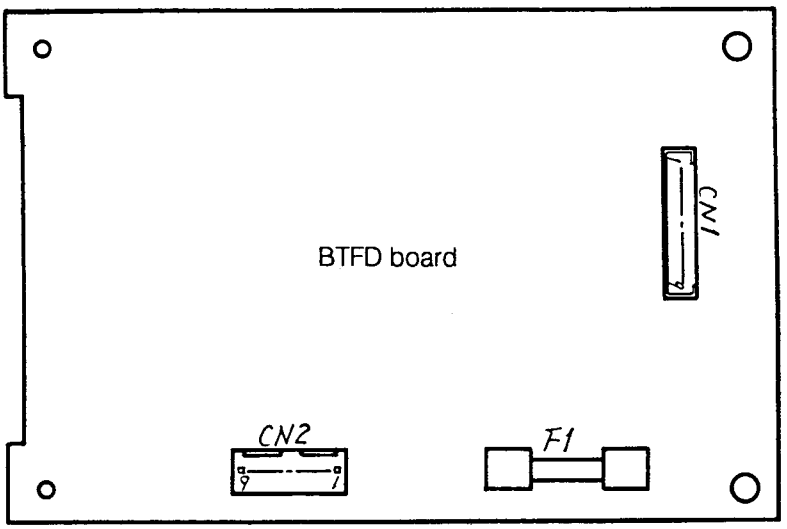

The SELECT indicator on the printer is off.
The ALARM indicator on the printer is lit.
YES
• Paper is stuck in the print head area.
• Faulty operation of spacing
• Remove the paper.
• See the troubleshooting flowchart in the printer maintenance manual.

8. CIRCUIT DIAGRAM

8.1 PCB Layout

— PCB List —

(1) Circuit board, BTFD



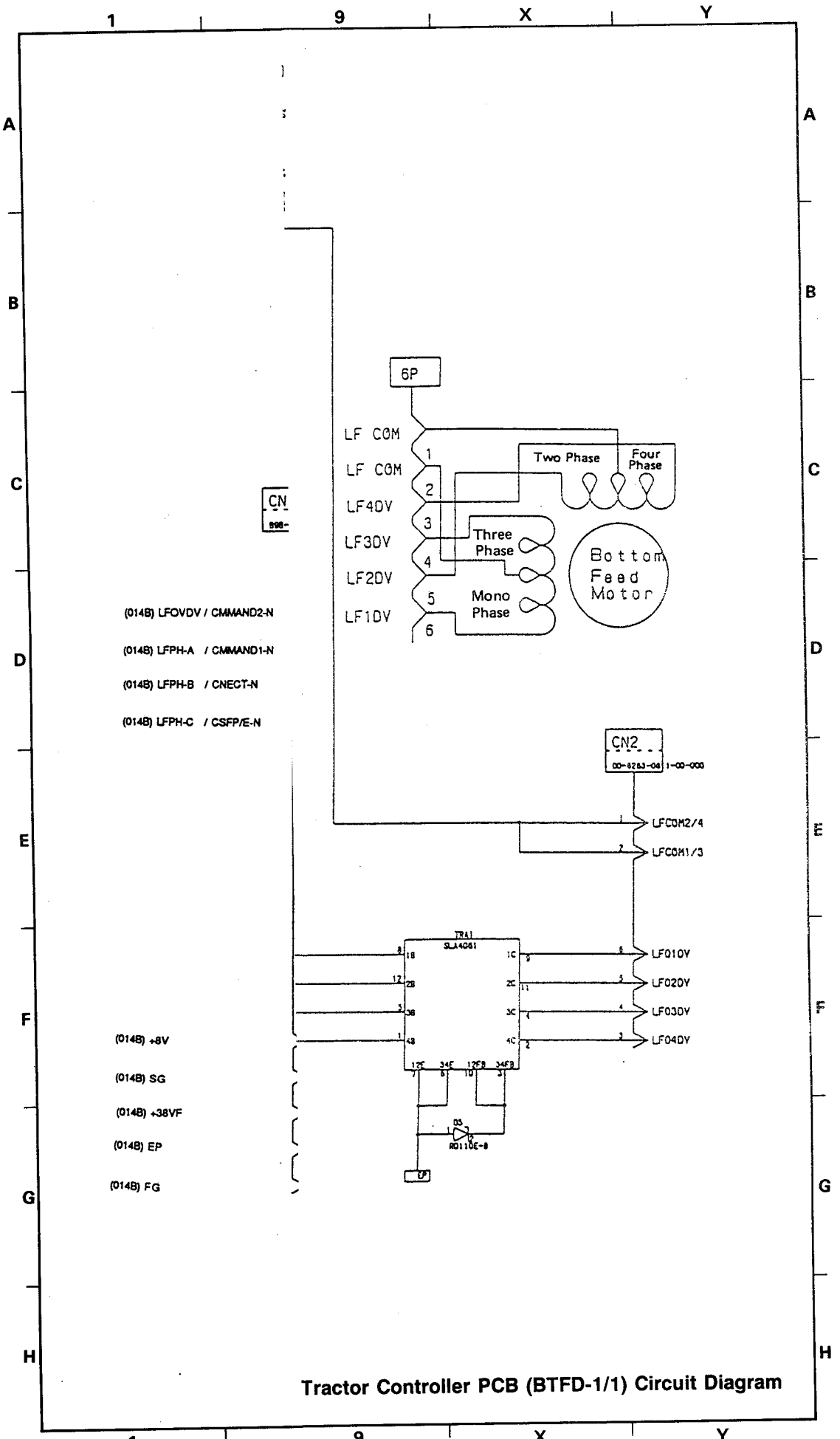
8.2 Signal List

- Interface between Bottom Push Tractor Unit and Printer Unit

Abbreviation of signal name	Signal name	Functions
LFOVDV-N	Bottom Line Feed Motor Over Drive	Bottom Line Feed Motor high voltage apply command
LFPH-A	Bottom Line Feed Driver	Bottom Line Feed Motor phase command
LFPH-B	Bottom Line Feed Driver	Bottom Line Feed Motor phase command
LFPH-C	Bottom Line Feed Drive	Bottom Line Feed Motor phase command
+38VF	+38 Volt	Power supply for drive circuit
EP	Power Ground	Ground of driving circuit system
0V	Signal Ground	Ground of signal circuit
+8V	+8 Volt	Power supply for logical circuit

8.3 Circuit Diagram

Figure 8-1 Bottom Push Tractor Controller PCB (BTFD-1/1) Circuit Diagram (PCB REV2)



Tractor Controller PCB (BTFD-1/1) Circuit Diagram

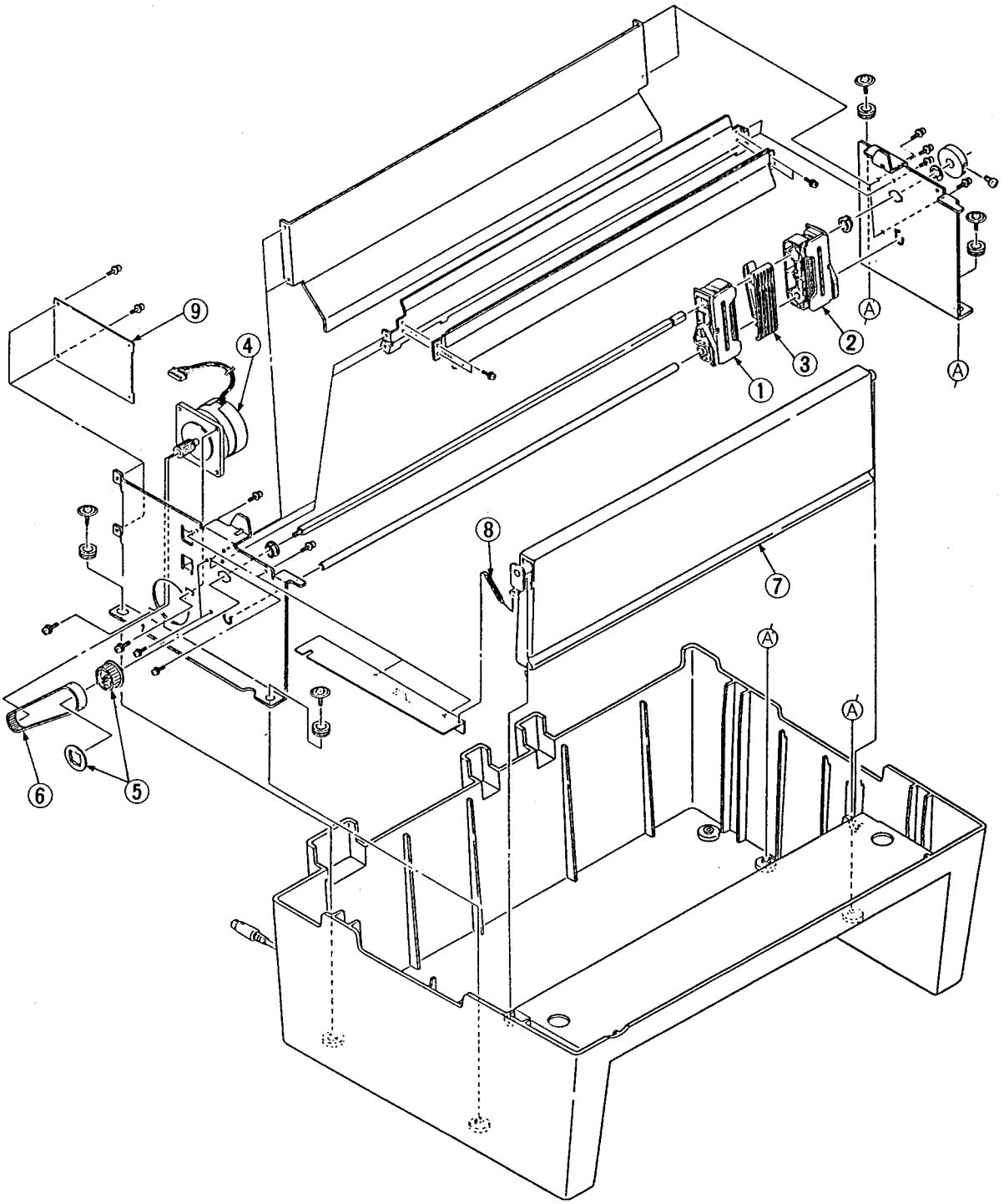
9. SPARE PARTS LIST

The following is a list of parts required for bottom push tractor maintenance.

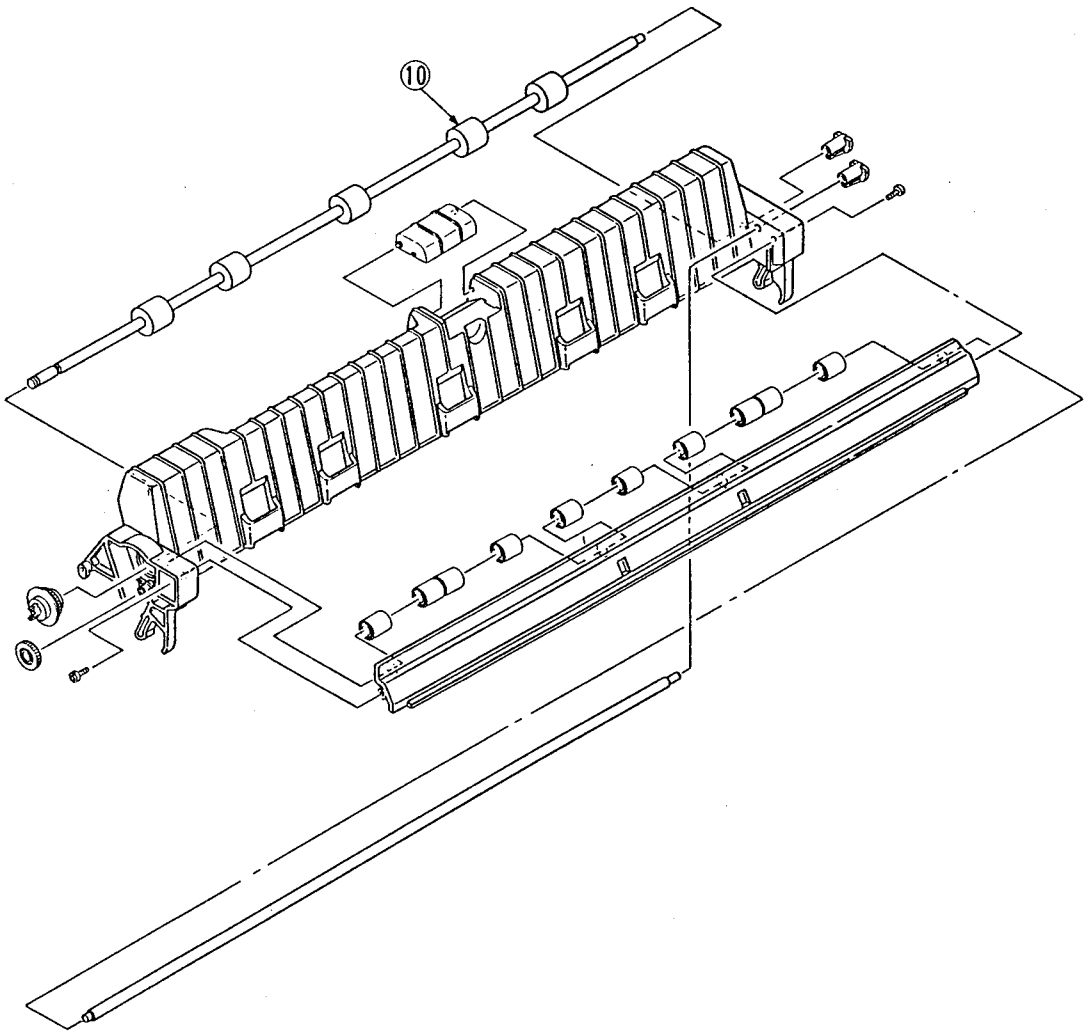
(1) How to read the list

- Number of required parts per year: The number of parts required to maintain a specified number of units. The number of units are represented by the following codes.

Code	Number of units
A	100 units
B	500 units
C	1000 units



Bottom Push Tractor



Upper Roller Assembly

Table of Parts Number

No.	Parts number	Description	Q'ty	Q'ty Per Year			Remarks
				A	B	C	
1	4PA4043-2684G2	Pin tractor assembly (L)	1	1	1	1	
2	4PA4043-2685G2	Pin tractor assembly (R)	1	1	1	1	
3	4PP4025-2653P1	Sheet guide	1	1	1	1	
4	3PB4043-4249P1	LF motor	1	1	1	1	
5	4PP4043-4283P1	Drive pulley	1	1	1	2	
6	4LP-1313-59	Mini-pitch belt (120 teeth)	1	1	2	3	
7	2PA4094-6159G2	Bottom cover assembly	1	1	1	1	
8	4PP4043-4300P1	Tension spring	1	1	1	1	
9	4YA4042-1513G1	BTFD board	1	1	1	1	
10	3PB4043-4272P1	Drive roller	1	1	2	3	